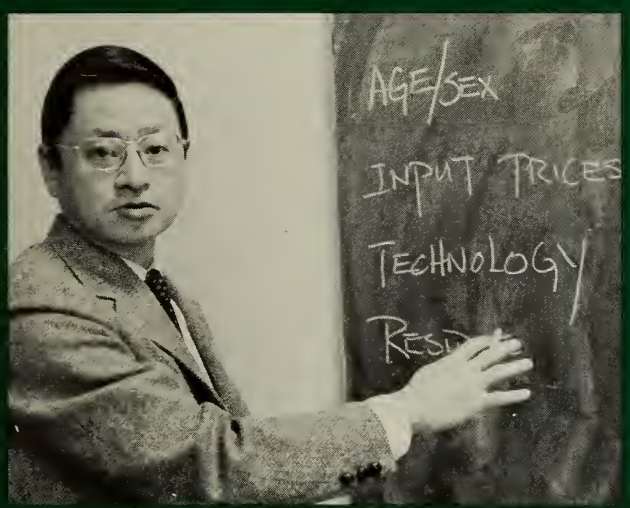
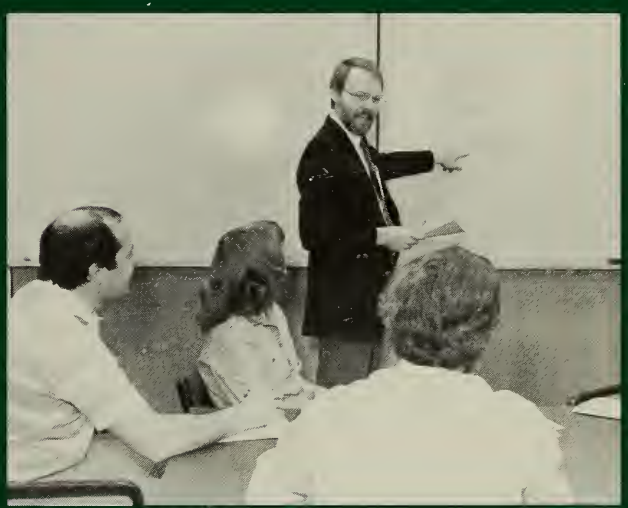
# Official Register of Harvard University

## 1985–86

# Harvard School Of Public Health



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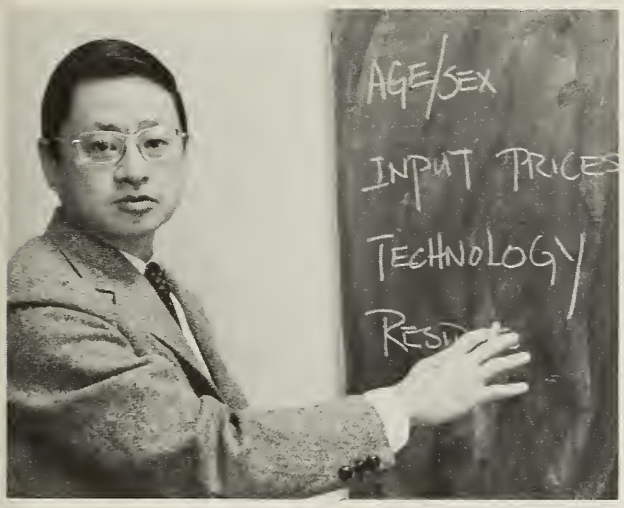


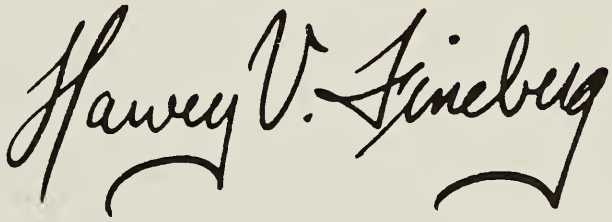
COVER: *Top, Dr. John Cairns, Professor of Microbiology, left, Dr. William Hsiao, Professor of Health Systems Economics, right, Dr. James Ware, Associate Professor of Biostatistics.*

## A Note from the Dean

Public health is concerned with preserving and enhancing the health of populations. The scope of public health is extensive, as reflected in the range of courses, departments, centers, programs, and facilities described in this *Register*. The interests and expertise of faculty at the School are similarly diverse, extending across biological sciences, social sciences, numeric disciplines, and more.

This *Register* contains a wealth of information about educational opportunities at the School of Public Health. Though we have endeavored to make it accurate and comprehensive, it is necessarily an incomplete description of the learning experience available at the School. The School of Public Health is a place to acquire new skills; a place to enrich one's professional perspective by interacting with fellow students as well as with faculty; a place to gain a more sophisticated understanding of health sciences, health issues and problems and their possible solutions; a place to test one's ideals, objectives and imagination against the imposing array of biological, individual, organizational, economic, and political barriers to improved public health.

The principal educational mission of the School is to prepare leaders in professional service and research aimed at promoting the health of populations. We believe we are engaged in a vital enterprise of central importance to society. We welcome those who join us at the School to share in that sense of excitement and challenge.



## Volume 6, Number 9

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Every effort is made to ensure the information contained in this *Register* is accurate at the time of publication. However, the School of Public Health reserves the right to make changes without notice in tuition and fees, admission and degree requirements, courses of instruction, and other information contained herein.

Harvard University's policy is to make decisions concerning applicants, students, faculty and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable anti-discrimination laws.

*The Harvard School of Public Health is accredited by the Council on Education for Public Health.*

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# *Academic Calendar 1985–86*

## Fall Term

**September 9, Monday**
Orientation and registration for new international students: 10:00 A.M., International House, 203 Park Drive.

**September 10, Tuesday**
Registration for new U.S. students: G-Level, Kresge Building, 10:30 A.M. - 2:00 P.M., according to first letter of last name:

A - F 10:30 A.M.
G - L 11:30 A.M.
M - S 12:30 P.M.
T - Z 1:30 P.M.

Opening session for all new students: 2:00-4:00 P.M., Snyder Auditorium, Kresge Building. All new students are required to attend the opening session and to be present for the registration and orientation period (Tuesday through Friday).

**September 11, Wednesday**
Registration for all returning students: G-Level, Kresge Building, 9:30-11:45 A.M., according to first letter of last name:

A - F 9:30 A.M.
G - L 10:15 A.M.
M - S 11:00 A.M.
T - Z 11:45 A.M.

The period between the opening sessions and September 13 will be devoted to orientation lectures, individual conferences with faculty members and selection of courses of study.

**September 12, Thursday, and September 13, Friday**
Faculty advisers will be available to meet with students.

**September 18, Wednesday**
First period "a" and "ab" courses begin.

**September 26, Thursday**
Last day to submit study cards to the Registrar's Office. Study cards not submitted by this deadline are subject to a charge of $25 per week.

**September 27 through October 4**
Students may submit drop/add/change petitions for "a" and "ab" courses until 3:00 P.M. Friday. The first petition is free; subsequent petitions are $20 each. (After October 4, petitions must be approved by the CAD and are subject to a charge of $30.)

**October 4, Friday**
Last day to cross register into HSPH "a" and "ab" courses. Last day to cancel registration for refund of fall term payment.

**October 14, Monday**
Columbus Day, a holiday.

**November 8, Friday**
First period ends.

**November 11, Monday**
Veterans' Day, a holiday.

**November 12, Tuesday**
Second period "b" and "bc" courses begin.

**November 12 through November 22**
Drop/add/change period for "b" courses: During November 12-15, petitions are free of charge. During November 18-22, the first petition is free; subsequent petitions are $20 each. (After November 22, petitions must be approved by the CAD and are subject to a charge of $30.)

**November 15, Friday**
Grades for "a" period due in Registrar's Office.

**November 22, Friday**
Last day to cross register into HSPH "b" courses. Last day to file petition for nonresident status for spring term.

**November 27, Wednesday (5:30 P.M.) through December 2, Monday (8:00 A.M.)**
Thanksgiving recess.

**December 20, Friday (5:30 P.M.) through January 2, Thursday (8:00 A.M.)**
Winter recess.

**January 17, Friday**
Second period ends. Last day to complete spring term 1985 courses graded as INCOMPLETE. Term break recess begins at 5:30 P.M.

**January 20, Monday**
Martin Luther King, Jr.'s Birthday, a holiday.

**January 21 through January 25**
Supervised special studies or field observations: "e" period.

**January 24, Friday**
Grades for "ab" and "b" periods due in Registrar's Office.

## Spring Term

**January 27, Monday**
Term break recess ends at 8:00 A.M. Third period "c" and "cd" courses begin. New students must register by 5:00 P.M.

**January 31, Friday**
Last day to submit study cards to the Registrar's Office. Study cards not submitted by this deadline are subject to a charge of $25 per week.

**February 3 through February 7**
Students may submit drop/add/change petitions for "c" and "cd" courses until 3:00 P.M. Friday. The first petition is free; subsequent petitions are $20 each. (After February 7, petitions must be approved by the CAD and are subject to a charge of $30.)

**February 7, Friday**
Last day to cross register into HSPH "c" and "cd" courses.

**February 17, Monday**
Washington's Birthday, a holiday.

**February 21, Friday**
Last day to cancel registration for refund of spring term payment.

**March 21, Friday**
Third period ends. Spring recess begins at 5:30 P.M.

**March 24 through March 28**
Supervised special studies or field observation: "f" period.

**March 28, Friday**
Grades for "c" period due in Registrar's Office.

**March 31, Monday**
Spring recess ends at 8:00 A.M. Fourth period "d" courses begin.

**March 31 through April 11**
Drop/add/change period for "d" courses: During March 31-April 4, petitions are free of charge. During April 7-11, the first petition is free; subsequent petitions are $20 each. (After April 11, petitions must be approved by the CAD and are subject ot a charge of $30.)

**April 11, Friday**
Last day to cross register into HSPH "d" courses. Last day to file petition for nonresident status for the academic year 1986-87.

**May 23, Friday**
Fourth period ends. Last day to complete fall term courses graded as INCOMPLETE. Last day to register and submit tutorial forms for HSPH summer tutorials.

**May 26, Monday**
Memorial Day, a holiday.

**May 28, Wednesday**
Grades for "cd" and "d" periods due in Registrar's Office.

**June 2, Monday**
Degree-voting faculty meeting.

**June 5, Thursday**
Commencement.

## Degree Calendar

| For a degree to be awarded | Degree applications due in Registrar's Office on Monday | Bound theses due by 3:00 P.M. in the Registrar's Office on Wednesday |
|---|---|---|
| November 18, 1985 | August 12, 1985 | November 6, 1985 |
| March 18, 1986 | November 25, 1985 | February 12, 1986 |
| June 4, 1986* | March 31, 1986 | May 28, 1986 |

*Degrees conferred
June 5, 1986
Commencement

# *Administration*

## President and Fellows of Harvard College

(This Board is commonly known as the Corporation.)

**Derek Bok**, A.B., J.D., A.M., LL.D., President

**Charles Pence Slichter**, A.B., A.M., Ph.D., Senior Fellow of Harvard College

**Robert Gregg Stone, Jr.**, A.B., Fellow of Harvard College

**Andrew Heiskell**, Ph.B., Fellow of Harvard College

**Colman Mockler, Jr.**, A.B., M.B.A., Fellow of Harvard College

**Roderick Martin MacDougall**, A.B., Treasurer of Harvard College

**Robert Shenton**, A.B., M.B.A., Ph.D., Secretary to the Corporation

*Harvey V. Fineberg, Dean of the Faculty of the School of Public Health, left, and Elkan R. Blout, Dean for Academic Affairs.*

## Administrative Officers

**Derek Bok**, A.B., J.D., A.M., LL.D., President

**Harvey Vernon Fineberg**, A.B, M.D., M.P.P., Ph.D., Dean of the Faculty of Public Health

**Elkan Rogers Blout**, A.B., Ph.D., A.M. (hon.), D.Sc. (hon.), Dean for Academic Affairs

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**Dade William Moeller**, S.B., S.M., Ph.D., Associate Dean for Continuing Education

**Ruth Heather Palmer**, B.A., M.B., B.Ch., S.M. in Hyg., Associate Dean for Students

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**Norman Henry Peterson**, Assistant Dean for Administrative Services

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**Margaret Catherine Salmon**, S.B., Assistant to the Dean for Faculty Administration

**Hanna Machlup Hastings**, A.B., A.M., Ed.M., Director of Student Affairs.

**Judith Eileen Hull**, B.Mus., M.Mus., Registrar

**Laura Rose Markowitz**, A.B., Ed.M., Director of Financial Aid

**William Salisbury Olney**, A.B., Director of the Associates Program

**Marcello Pagano**, B.Sc., S.M., Ph.D., Director of the Health Sciences Computing Facility

**Judith Anne Skolnick**, A.B., Personnel Officer

**James Joseph Feeney**, A.B., M.D., Director of The Medical Area Health Service

**C. Robin LeSueur**, B.A., B.S.W., M.L.S., Librarian, Francis A. Countway Library of Medicine

## Directors of Centers, Offices, and Special Programs

**David Elliott Bell**, A.B., A.M., LL.D. (hon.), Director of the Center for Population Studies and Acting Director of the Takemi Program in International Health

**J. Larry Brown**, A.B., A.M., M.S.W., Ph.D., Director of the Community Health Improvement Program

**Richard Alan Cash**, S.B., M.D., M.P.H., Director of the Office of International Health Programs

**William John Curran**, J.D., LL.M., S.M. in Hyg., Public Health for Lawyers

**John Rouben David**, A.B., M.D., A.M. (hon.), Director of the Center for the Prevention of Infectious Diseases

**Margaret Elizabeth Drolette**, A.B., M.P.H., Ph.D., Chief Coordinator of the Master of Public Health Program

**Howard Stanley Frazier**, Ph.B., M.D., Director of the Institute for Health Research

**Donald Frederick Hornig**, S.B., Ph.D., Director of Interdisciplinary Programs in Health

**John Bertram Little**, A.B., M.D., Director of the Kresge Center for Environmental Health

**Richard Redding Monson**, S.M., M.D., S.M. in Hyg., Director of the Educational Resource Center for Occupational Health and Safety

*Dr. Richard Monson, Professor of Epidemiology.*

*Dr. Margaret Drolette, Professor of Biostatistics.*

# *Degree Requirements*

The School of Public Health offers programs leading to the graduate degrees of *Master of Public Health* (M.P.H.), *Doctor of Public Health* (Dr.P.H.), *Master of Occupational Health* (M.O.H.), *Master of Science* in a specified field (S.M. in . . . ), and *Doctor of Science* (S.D.). The general degree requirements and the respective requirements for admission are discussed in the following sections.

## Master of Public Health

The program leading to the Master of Public Health degree consists of one academic year of study designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. Through the choice of elective courses, students may acquire more breadth of knowledge or may pursue in some depth one or more areas of particular relevance to their career goals. The M.P.H. degree program may serve as a required academic year for residency training (see page 25).

**Requirements for Admission**

Applicants to the M.P.H. program must satisfy the Committee on Admissions and Degrees as to their academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health. Ordinarily, an applicant should hold a doctoral degree in medicine, dentistry or veterinary medicine. Consideration is also given to applicants who hold doctoral degrees in biology, behavioral sciences, other natural sciences and social sciences, or law, economics, engineering, and certain related fields regarded by the School as appropriate background for entrance into the public health profession. Applicants who hold an earned doctoral degree are urged to submit scores from the Aptitude Test of the Graduate Record Examination (GRE) or other aptitude tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT) or the Dental Aptitude Test (DAT), if available. However, applicants to the Department of Health Policy and Management who hold a doctoral degree *must* submit scores from one of these standardized tests.

Consideration for admission to the M.P.H. program is given also to an applicant who holds a master's degree in a field related to public health such as nursing or social work, with a highly distinguished academic record, and with substantial professional experience (usually at least three years in an administrative position of responsibility). These applicants must be able to demonstrate sufficient knowledge and competence to satisfy the Committee on Admissions and Degrees as to their qualifications for professional public health education and must submit scores from the Aptitude Test of the Graduate Record Examination. Scores from the GRE Aptitude Test should be no more than five years old.

Applicants from countries where English is not the language of instruction must submit a score from the Test of English as a Foreign Language (TOEFL). Ordinarily, the TOEFL score must be 550 or better before the applicant can be considered for admission.

If a student who is enrolled in the M.P.H. program wishes to continue at the School after completing the M.P.H., he or she may consider applying for a Master of Science or doctoral program in any of the departments which offer such programs for which he or she meets the requirements. Interested students should refer to the section on admissions for procedures and application deadlines.

**Requirements for the Degree**

An M.P.H. degree candidate must spend one academic year in residence at the University and must successfully complete courses totaling a minimum of 40 credit units. Students will be encouraged to take a total of 45 to 50 credit units.

Candidates for the M.P.H. degree are expected to complete the requirements in one academic year of full-time study. In rare instances, upon written request to the Committee on Admissions and Degrees, a student may be allowed to complete the program over a period of two academic years. The M.P.H. core courses must be completed in the first year.

**The Core Curriculum**

The core curriculum, required of *all* M.P.H. degree candidates, is designed to provide a fundamental knowledge of the major areas of public health. Students must take the four core courses which cover the environment, quantitative methods, and health administration and management. In addition, students select one course that uses the case method to integrate the various disciplines of public health. The core courses are:

1. ESP 201a or 201c, *Principles of Environmental Health I* (2.5 credit units) plus either 202b *Principles of Environmental Health II* (2.5 credit units) or 203d *Principles of Environmental Health III* (2.5 credit units)
2. BIO 200a,b. *Introduction to Statistical Methods* or BIO 201a,b, *Principles of Biostatistics* (5 credit units)
3. EPI 201a, *Epidemiology in Public Health* or EPI 221a, *Applications of Epidemiology in Public Health* (2.5 credit units)
4. HPM 221a,b, *Managing Health Delivery Organizations* (5 credit units)

   *AND* a case studies course. A list of case studies courses will be provided before registration.

Ordinarily, the core courses represent less than half the total number of credit units recommended for the degree, thus allowing for flexibility in the program. Descriptions of each course appear in the section *Courses of Instruction*.

**Master of Public Health Program Office**

*Chief Coordinator:* Dr. Drolette
*Coordinators:* Dr. Mariner and Dr. Wyon

The coordinators have day-to-day responsibility for the M.P.H. degree program, oversee the core curriculum and serve as the M.P.H. Subcommittee of the Committee on Admissions and Degrees. They meet regularly with the Master of Public Health Program Committee, composed of a faculty representative of each department at the School, and representatives of students, alumni and the School administration. The M.P.H. Program Office, located in the Office of Student Affairs, serves as a departmental office for students in the General Program, and provides a central source of information about the M.P.H. degree program to all students and applicants.

**Departmental Concentrations**

The M.P.H. is an interdisciplinary degree and does not carry a departmental designation. Many students have specialized goals and choose to take most of their elective courses in one department. They often prefer to concentrate in that department. Departments differ in their expectations of M.P.H. degree candidates. Some advise them to take a specific set of courses over and above the M.P.H. core curriculum, while others determine students' needs on an individual basis. For further information about a specific departmental concentration, please check with the department.

**The General Program**

The General Program, under the direction of the coordinators of the M.P.H. program, recognizes that many students seek a broader view of public health than that which a departmental affiliation offers. Students in the General Program may choose their elective courses from a variety of courses offered by the School of Public Health and other faculties at Harvard as well as appropriate courses offered at MIT. (See page 96 for information about cross-registration.) Faculty advisers are assigned with each student's background and interests in mind. Members of the M.P.H. Committee serve as advisers to most of the students in the General Program. Even within the General Program, it is possible for a student to concentrate to some extent in a particular discipline through the appropriate choice of electives.

**Combined Degree Programs**

Students currently enrolled in an M.D., D.M.D., D.D.S., or D.V.M. program may apply for admission to the M.P.H. program, provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees at the School of Public Health and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental or veterinary school for enrollment in their third or fourth year. Requirements for the M.P.H. degree (described on page 17) are the same for students in the combined degree program as for all other M.P.H. degree candidates. Students enrolled in a combined degree program with the M.P.H. will receive the M.P.H. upon successful completion of both degree programs and conferral of the doctoral degree.

# Doctor of Public Health

The Doctor of Public Health is an advanced professional degree for those who intend to pursue academic or research careers in public health, including administrative, planning or evaluation roles in public health practice. The degree is granted on successful completion of an approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis.

**Requirements for Admission**

An applicant for admission to candidacy for the Doctor of Public Health degree normally must be a graduate of an approved school of medicine, dental medicine or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. In addition, the applicant must hold, or be in progress toward, the degree of Master of Public Health, or its equivalent, from an approved institution.

Applicants must be able to satisfy the Committee on Admissions and Degrees as to their overall qualifications for doctoral study at the School and must demonstrate potential ability to undertake original investigation in a special field. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants who do not hold an earned doctoral degree and should be no more than five years old.

Applicants who hold an earned doctoral degree are urged to submit aptitude scores from the GRE, or other tests such as LSAT, MCAT or DAT, if available. Applicants to the Department of Health Policy and Management, however, *must* submit the GRE, except physicians or dentists, who may submit the MCAT or DAT.

**Requirements for the Degree**

Formal requirements for the Doctor of Public Health degree are the same as those for the Doctor of Science degree. A brief summary of these requirements appears on page 24.

## Master of Occupational Health

The program leading to the Master of Occupational Health degree is designed to provide physicians with postgraduate training in the public health disciplines relevant to preventing occupational disease and injury. This one-year degree program is usually taken as part of a two-year approved residency in occupational medicine. Please refer to the Occupational Medicine section under the listing for the *Educational Resource Center for Occupational Safety and Health.*

**Requirements for Admission**

Candidates must be graduates of an approved school of medicine and must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at the graduate level. Students from the United States should have completed an internship or residency of at least 12 months in a hospital approved by the American Medical Association. Applicants are urged to submit scores from the Medical College Admissions Test (MCAT) or the scores of the Aptitude Test of the Graduate Record Examination (GRE), if the latter are available.

**Requirements for the Degree**

Candidates for the M.O.H. degree must spend one academic year in residence at the University and must successfully complete a program of at least 40 credit units, comprising both required and elective courses.

All candidates are expected to take the following courses unless they can demonstrate equivalent preparation:

1. BIO 200a,b, *Introduction to Statistical Methods* (5 credit units) or BIO 201a,b, *Principles of Biostatistics* (5 credit units)
2. BIO 202c,d, *Statistical Methods for Epidemiologic Research* (5 credit units) or BIO 203c,d, *Statistical Methods in Experimental Research* (5 credit units). Not required, but strongly recommended.
3. ESP 231c,d, *Policy Issues in Occupational Health* (5 credit units) or equivalent
4. ESP 232c,d, *Introduction to Occupational Medicine* (2.5 credit units)
5. ESP 233c, *Industrial Toxicology* (2.5 credit units)
6. ESP 234d, *Basic Problems in Occupational Health* (2.5 credit units)
7. ESP 251a, *Health Hazards of Manufacturing Processes* (2.5 credit units)
8. ESP 252b, *Introduction to Industrial Hygiene* (2.5 credit units)
9. EPI 201a, *Epidemiology in Public Health* (2.5 credit units)
10. EPI 202b, *Principles of Epidemiology I: Elements of Study Design and Data Analysis* (2.5 credit units) or EPI-ESP 215c,d, *Environmental and Occupational Epidemiology* (2.5 credit units)
11. TOX 204a, *Introduction to Principles of Toxicology* (2.5 credit units)

The required courses listed above comprise 30 credits. Additional courses may be selected from the curriculum approved for residencies in occupational medicine.

## Master and Doctor of Science

The School offers programs leading to the degrees of Master of Science in designated fields of concentration and Doctor of Science. The prospective applicant should note that in some areas the Master of Science program is intended primarily or wholly as preparation for doctoral study; applicants are screened for their interest in, and potential for, doctoral work, and the majority of students continue toward the Doctor of Science degree. In other areas, the Master of Science is viewed primarily or wholly as a professional degree; while a small percentage of students may continue for the doctorate, the majority discontinue study upon receipt of the S.M. degree. Finally, students in still other areas are divided almost equally between those who pursue the Doctor of Science degree and those who discontinue their studies upon receipt of the S.M. degree.

Occasionally, a student may be admitted to a master's program or to candidacy for a doctoral degree in more than one of the disciplines, if the program meets the requirements of the respective departments or programs involved. In such instances, the master's degree conferred specifies the areas.

Because there is considerable variability among the S.M. and S.D. programs in different fields, both in their overall goals and their specific admission and degree requirements, applicants are urged to consult the program descriptions which provide basic information in specific areas. Additional information may be obtained by contacting the respective departments or programs, as indicated in the degree designation.

## Master of Science in Specified Field

In general, the programs leading to the degree of Master of Science in a specified field of concentration are designed for students with interests in the scientific basis of public health and preventive medicine. The degree is granted upon fulfillment of a program of advanced work in the public health disciplines represented by departments and certain programs in the School. Students may be admitted to either a one- or two-year master's program, depending upon the requirements of the particular program. Information about requirements for one- and two-year programs in various areas is included in the program descriptions.

**Requirements for Admission**

Applicants to Master of Science degree programs must satisfy the Committee on Admissions and Degrees as to their overall qualifications and promise for successful graduate study at the School. Applicants must also satisfy the department or program to which admission is sought that they have an adequate academic and/or professional background appropriate for specialization in that field.

Conditions of eligibility for one-year or two-year programs vary with the area or department in which a student wishes to specialize. Prospective applicants should consult program descriptions for more specific information.

Generally, eligibility for admission to a one-year program is limited to graduates of approved schools of medicine, dentistry or veterinary medicine, or to applicants who have earned doctoral or, for some programs, master's degrees in fields acceptable to the department(s) to which admission is sought. Applicants holding master's degrees may be considered for admission to one-year or two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.

An applicant holding a baccalaureate degree is normally considered for admission to a two-year program, in order to complete the requirements for a Master of Science degree. For a few programs, including industrial hygiene, air pollution control and radiological health, applicants may be considered for a one-year program if they hold a bachelor's degree with adequate scientific and engineering training and if they have had at least two years of relevant professional experience in the field of specialization.

Occasionally, a year or more of appropriate graduate work in an approved institution may enable a student to fulfill two-year program requirements in one year. In some cases, however, program requirements are such that a student must spend one-and-a-half or two years in residence in order to complete the necessary courses, regardless of prior training and experience.

All candidates for admission to a Master of Science program who do not hold an earned doctoral degree must submit scores from the Aptitude Test of the Graduate Record Examination. Applicants who hold an earned doctoral degree are urged to submit scores from the GRE or other tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT) or the Dental Aptitude Test (DAT), if available.

The GRE is required for *all* applicants to the Department of Health Policy and Management except lawyers, physicians, dentists, and law, medical or dental students who may submit the LSAT, MCAT or DAT scores.

Applicants are advised to take the Graduate Record Examination no later than the December test administration date. GRE scores submitted should be no more than five years old. An official score report must be received from the Educational Testing Service before final action will be taken on the application. Additional information concerning the Graduate Record Examination requirement is included in the instructions accompanying the application form.

**Requirements for the Degree**

Students admitted to a one-year program must spend a minimum of one academic year in residence at the University and must successfully complete a program of at least 40 credit units. Students admitted to a two-year program must spend two academic years in residence and must successfully complete a program of at least 80 credit units.

While specific course requirements vary from program to program, all candidates for a Master of Science degree are required to take BIO 200a,b, or 201a,b and EPI 201a or EPI 221a, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take ESP 205a,b, or its equivalent, or a course in general biology elsewhere. Beyond these minimal course requirements, each program may specify additional courses that are necessary for satisfactory fulfillment of degree requirements in the particular area of specialization. These specific course requirements are generally *not* listed in this *Register*. The student should consult with his or her adviser or department or program head about these requirements before deciding which courses to take.

**Combined Degree Programs**

The admission and degree requirements for the Master of Science degree are the same as those listed for the Master of Public Health degree.

## Doctor of Science

The Doctor of Science degree is an advanced graduate degree for those who intend to pursue academic or research careers in public health. The degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and upon the presentation of this research in an acceptable thesis.

**Requirements for Admission**

Applicants for admission to candidacy for a Doctor of Science degree must satisfy the Committee on Admissions and Degrees and the department of specialization as to their overall qualifications for doctoral study and their ability to undertake original research in their chosen field. All candidates for a Doctor of Science degree must hold a baccalaureate degree. In some instances, an applicant will be expected to complete the Master of Science degree at the School before being granted admission to doctoral study. In such cases, the student will first be admitted to a Master of Science program. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants to doctoral programs who do not hold earned doctoral degrees and should be no more than five years old. Applicants who hold an earned doctoral degree are urged to submit Aptitude Test scores from the GRE, or LSAT, MCAT or DAT tests, if available. Applicants to the Department of Health Policy and Management, however, *must* submit the GRE, except physicians or dentists, who may submit the MCAT or DAT.

Because specific prerequisites vary with the discipline or field of specialization, prospective applicants are urged to consult the program descriptions in this *Register* and the department or program to which admission is sought for more detailed information.

**Requirements for the Degree**

A minimum of two academic years of full-time study in residence at the University is required of students enrolled in the doctoral program. The required work and preparation of an acceptable thesis, however, ordinarily take longer. Residence requirements are fulfilled by payment of tuition (see page 103) and pursuit of an academic program approved by the department of concentration and the Committee on Admissions and Degrees.

The Committee on Admissions and Degrees is responsible for overseeing the programs of all doctoral students. During the registration period, each doctoral student will receive a manual detailing the principles and procedures that are to be followed. A brief summary of requirements is given below.

Each doctoral student is required to take 40 to 60 credits in graduate-level courses distributed over a major and two minor fields. Each minor field will ordinarily consist of at least 10 credits in formal courses. Such requirements may be reduced in cases of prior relevant course work or experience. They may be increased in cases where there has been a substantial shift in field. Courses in the major and minor fields must be completed with distinction, with grades of "A" or "B." Unless equivalent preparation can be demonstrated, doctoral students must take EPI 201a or EPI 221a as well as courses in biostatistics through the intermediate level (ordinarily BIO 202c,d). Departments may stipulate specific course requirements and may require written and/or oral examinations on the course work in the three fields.

**Qualifying Examination**

By the end of the second year, the student should be prepared to take the oral qualifying examination. The main emphasis of this examination is to assess the student's potential to perform research in his/her chosen field. Since most doctoral research in the School requires a substantive knowledge of more than one discipline or field, the examining committee will include faculty from disciplines representing the minor fields as well as the major. The examination will include questioning in the major and minor fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members is to be appointed within one month after the qualifying examination is passed. This committee has the responsibility for guiding the student's research through to completion. It will meet with the student at least once every six months to discuss details of the student's progress.

**Thesis**

An acceptable thesis must ordinarily be submitted within five years of the date of registration as a doctoral candidate. The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. Detailed requirements are available from the Registrar.

The thesis will not be accepted until a public presentation and discussion has been held, with the research committee in attendance.

Three bound copies of the approved thesis must be in the Registrar's Office before the faculty will vote the degree at their regular meetings in November, March or June.

Occasionally, thesis work will be performed in *nonresident* status. Before the doctoral subcommittee of the CAD grants such status, it is necessary that the research committee meet with the candidate to appraise the thesis plan. Agreement must be reached and the doctoral subcommittee must be advised in writing *before departure of the student* as to (1) acceptability and feasibility of the proposed thesis plan; (2) the timing and scope of the periodic written reports that will be required of the student; (3) arrangements that have been made or will be made for direct field supervision of the student; and (4) the minimum period of time the student will spend back at the School before the presentation and defense of the thesis. In no case will the doctoral subcommittee grant *nonresident* status for more than one year at a time.

Students wishing further information on doctoral program requirements should refer to the handbook *Information for Doctoral Students*, available in the Registrar's Office.

## Residency for Board Certification

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in Occupational Medicine.

For physicians who apply for and are accepted into an Occupational Medicine Residency, credit is given for one year of study leading to a public health degree. The residency also includes one year of supervised problem solving, research and clinical practice.

Additional information about the residency program may be obtained from Dr. Ian Greaves, Assistant Professor of Occupational Health.

Some financial support may be available through traineeships or National Research Service Awards for degree programs (U.S. citizenship or permanent residence status required). Further information on financial aid can be obtained from Dr. Greaves, or from Ms. Laura R. Markowitz, Director of Financial Aid.

## Postdoctoral Fellowship Program in Dental Public Health, Epidemiology and Dental Care Administration

The School of Dental Medicine, in cooperation with the School of Public Health, offers a program covering three academic years of postdoctoral study, intended to prepare a limited number of individuals for creative full-time teaching, research and/or administrative careers in dental public health, epidemiology and dental care administration. Each person

accepted into the program will be appointed as a Clinical or Research Fellow in Dental Care Administration at the School of Dental Medicine. The program is open to dentists and other qualified health professionals.

The program is in three parts of approximately one year each, which need not be completed in succession. One part of the program involves a formal course leading to a degree of Master of Science or Master of Public Health. The core courses must be completed in the first year at the School of Public Health and all requirements for the master's degree in a maximum of two academic years. Candidates with an equivalent degree from another school, however, may be accepted into the Postdoctoral Fellowship Program with one year advanced standing. The second portion involves a one-year supervised residency at the community, state or national level in epidemiology or health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health, other departments of the University, and/or other institutions. Epidemiological or health services research can be carried on over the entire three-year period in a variety of situations involving either new or continued studies. A research thesis is prepared for presentation at the end of the third year.

Fellows in Dental Care Administration who wish to become candidates for a degree in public health must meet the admission requirements of and be accepted into the School of Public Health. Application should be made directly to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

Upon successful completion of this program, the candidate will receive the S.M. or the M.P.H. degree from the School of Public Health, as well as a Certificate of Postdoctoral Study in Dental Care Administration and a certificate of completion of residency requirements from the Harvard School of Dental Medicine.

Academic study beyond the master's level may be arranged with the School of Public Health and other departments of the University.

For further information and application forms, write to the Head, Committee on Postdoctoral Education, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts 02115.

*Facing page, Dr. Steven Gortmaker, Associate Professor of Sociology, and Acting Chairman of the Department of Behavioral Sciences.*

# *Departments and Programs*

# Department of Behavioral Sciences

Steven L. Gortmaker, A.B., S.M., Ph.D., Associate Professor of Sociology and Acting Chairman of the Department

**Faculty** Professor Pierce; Visiting Professor Mertens; Associate Professor D. Walker; Lecturers Cleary, McAuliffe and Wechsler

**Teaching and Research Staff** Visiting Lecturer Levine; Lecturer Benfari; Instructor Daltroy

**Introduction** The Department of Behavioral Sciences seeks to train researchers, teachers and professionals in the knowledge and analytical skills of the behavioral sciences relevant to significant public health issues. The specific focal points for teaching and research are: (1) health promotion and education programs; (2) the influences of behavior on health and disease; (3) behavioral pathologies, including addiction to drugs and alcohol, mental illness and child abuse; (4) behavioral aspects of health services, including psycho-social factors affecting the utilization of services and compliance with medical regimens, as well as the behavior of health professionals; and (5) social science methodologies as applied to public health problems and the evaluation of health services and programs.

**Degrees** Master of Public Health with concentration in Behavioral Sciences; Master of Science in Behavioral Sciences; and Doctor of Science.

**Research** Current research projects include studies of drug and alcohol use and addiction, infant mortality, functional status of handicapped and chronically ill children, adolescent pregnancy, and a variety of interventions to promote healthy behavior among children, youth and adults.

Research focuses on opiate addiction among street addicts, causes of relapse and methods of improving drug user treatment programs. A current survey of physicians, pharmacists and their students is aimed at discovering the causes of impairment in health professionals.

Studies continue into the use of alcohol and drugs among junior high school, high school and college students, and evaluations of programs developed to reduce such use are conducted on an ongoing basis.

A major longitudinal evaluation of the Robert Wood Johnson Foundation's Rural Infant Care Program is examining the success of various prenatal and infant health programs in reducing infant mortality and morbidity. Another such longitudinal evaluation is being conducted in seven community sites across the country to assess the long-term impact of secondary prevention programs for adolescent pregnant women and school-aged parents. A study of the correlates of women's psychosocial health status during the first six months after delivery is being conducted in a local Boston obstetrical practice.

Research exploring the relationships among social supports, the availability and use of community services, family organizations, and the management and functioning of children with chronic illness is ongoing, using data collected for the National Health Interview Surveys and

the Community Child Health Studies in three communities: Flint, Michigan; Cleveland, Ohio; and Berkshire County, Massachusetts. Studies of environmental, social and behavioral influences on the prevalence of childhood and adolescent obesity are being conducted, focusing on the impact of television viewing and recent trends in the United States.

The Harvard unit of the nation-wide Multiple Risk Factor Intervention Trial (MRFIT) has completed 10 years of research testing of the hypothesis that mortality from coronary heart disease can be reduced by altering the risk factors of elevated blood pressure, elevated blood cholesterol and cigarette smoking. Published analyses show substantial reductions in all three risk factors.

Data collected from the Field Study of Youth Health Promotion Processes are being analyzed to determine how unhealthy life styles are adopted and what intervention can prevent the onset of smoking, alcohol and drug abuse. Research was done in inner city and suburban schools in Boston and in two small towns in California, in collaboration with researchers at Stanford University.

Recent research has examined the area of health training and the role of stress and social support systems in the use of primary care health services.

## Programs

**Goals**

Designed to train persons in the behavioral aspects of health and health services. Students learn research skills, techniques of applying behavioral sciences to public health issues and relevant elements of behavioral disciplines.

**Curriculum**

Master's candidates do course work in areas of health and behavior, health promotion/education, behavioral aspects of health services, and behavioral pathologies. Doctoral students are expected to develop expertise in three major areas of behavioral sciences, research methods and statistical computing, and an area of specialization such as the self-help approach to alcohol and drug treatment, smoking prevention and models of contraceptive behavior.

**Admission**

Applicants for the doctoral program must have a baccalaureate degree in a related behavioral sciences discipline. These individuals are admitted directly into the doctoral program.

**Career Outlook**

Recent graduates have taken research and teaching positions in major health institutions and academic settings.

*Some of the courses the Department offers are described on page 124.*

# Department of Biostatistics

Marvin Zelen, S.B., A.M., Ph.D., Professor of Statistical Science and Chairman of the Department

**Faculty**

Professors Drolette, Miettinen (on leave), Mosteller, Pagano, and Weinstein; Associate Professors Begg, H. Feldman, Feldstein, Gelber, Gelman, D. Harrington, Lagakos, Laird, Lavin, Louis, Mehta, Schoenfeld, Tsiatis, and Ware; Assistant Professors Amato, Anderson, Finkelstein, Gray, and Larson; Lecturer Bailar; Member of the Faculty Greenes; Emeritus Professor Reed

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Anderson, Garsd, James, Kent, Mangione, McFadden, Smith, Waternaux, and Wyshak; Research Associate and Lecturer Awerbuch

**Introduction**

The Biostatistics program is designed to prepare students for careers which contribute to the theory and practice of statistical and computer sciences as applied to the Health Sciences. Programs of study are offered in Applied Biomedical Computing, Biostatistics and Health Decision Sciences. Many unique opportunities exist to participate in methodological research and interdisciplinary collaborations.

**Degrees**

Master of Public Health with concentration in Biostatistics; Master of Science in Biostatistics; joint Master of Science with another department; Doctor of Science; and Doctor of Public Health.

**Activities of the Department**

The Department carries on a broad program of research activities in Biostatistical Science. During the 1984-85 academic year, there were working seminars meeting throughout the year on Bioassay, Biomedical Computing, Clinical Trials, Mathematical Modeling, and Statistical Methods in Epidemiology.

Current areas of emphasis include: *Environmental Health* — The Department engages in interdisciplinary research in health effects of air pollution, carcinogenesis testing and environmental monitoring. Recent studies have investigated cancer incidence near hazardous waste disposal sites, the carcinogenic effects of food dyes and the effects of particulate air pollution on respiratory health among children. *Computing* — Members of the Department are involved in research on statistical computing algorithms, data-base management, software engineering and expert systems. The School of Public Health has excellent computing facilities and supports all the commonly used statistical packages. Much of the Department's research on computing is carried out at the Dana-Farber Cancer Institute and the Health Sciences Computing Facility. *Medical Statistics and Clinical Trials* — The Department has a major commitment to collaborative clinical research in the treatment of cancer. The faculty includes leaders in the development of statistical and computing methods for clinical trials, including sequential methods, survival data analysis and data-base management. Members of the Department are involved in more than 100 national and international clinical trials currently in progress. *Health Decision Sciences* — The Department engages in research on quantitative problems in health risk analysis, technology assessment and clinical decision making. Faculty members

are investigating new methods for assessing risks and benefits associated with environmental regulations; costs, risks and benefits of clinical practices and medical technologies; and the impact of organizational structure on decision making. The Department maintains a close relationship with the Institute for Health Research and the Department of Health Policy and Management. *World Health Organization* — The Department has been designated as a Biostatistics Evaluation Center by the World Health Organization. This activity is aimed at cancer control activities with special attention to the developing countries of the world. *Consulting* — The Department participates in a wide variety of medical research projects through the Biostatistics Consulting Laboratory. Students are expected to develop consultative and data analytic skills through participation in these consulting projects.

**Programs**

*The One- and Two-Year Master's Programs in Biostatistics*, leading to the S.M. degree, provide rigorous training and practical experience in statistical methods. One can also obtain an S.M. which is joint with another Department. Students enrolled in the School's M.P.H. Program may concentrate in Biostatistics.

Course work includes the mathematical basis of statistical inference; statistical methodology, epidemiology and computing; and a selection from courses in biomedical sciences and health policy and management. Besides course work, students are given experience in consulting and computing and the opportunity to teach in the Department's School-wide courses.

Candidates should have strong preparation in the calculus and linear algebra. The one-year program is limited to students who already have a graduate degree in one of the mathematical sciences or who are otherwise unusually well prepared.

*The Doctoral Program in Biostatistics*, leading to a Doctor of Public Health or Doctor of Science degree, aims to develop the capability for research and scholarship, as well as providing a rigorous training in statistical practice.

Doctoral students may concentrate on either a Theoretical Track or an Applied Track. Course work includes the mathematical foundations of statistical inference, statistical methodology, epidemiology, and computing. Students on the Applied Track develop expertise in an allied field of public health. The students also gain experience in consulting, computing and teaching.

In the second year of course work, doctoral candidates are expected to take a comprehensive written examination and make an oral presentation of research plans. The doctoral thesis may include either original contributions to statistical methodology related to the health sciences or innovative application to a field of public health or medicine.

Students may enter the doctoral program through the master's program or can enter the doctoral program directly.

*Nan Laird, Associate Professor of Biostatistics.*

*The Applied Biomedical Computing Program* aims to acquaint students with both hardware and software and to train them in areas of application which are important in biomedical research. Besides the required courses in biostatistics and epidemiology, students in this program will take courses in computer operating systems, software engineering, data-base management, graphics, and laboratory science. They will also gain practical experience in biomedical computing in one of the Harvard-affiliated hospitals or the Health Sciences Computing Facility.

Both master's and doctoral degrees are offered in Biostatistics with special concentration in the Biomedical Computing Program.

*The Health Decision Sciences Program* offers training in quantitative techniques in decision making at individual (clinical) and collective (policy) levels. In addition to core courses in probability and statistics, students take courses in decision analysis, cost-benefit and cost-effectiveness analysis, operations research, applied economics, behavioral decision theory and computing. While methods are taught rigorously, applications to medicine, health care policy and environmental risk analysis are emphasized.

Candidates may apply either to the master's or doctoral degree programs in health decision sciences. The principal degree program is the doctoral program. The master's program is intended primarily for individuals with a medical background and adequate quantitative preparation, or for other individuals with limited quantitative background who expect to apply for admission to the doctoral program after one or two years.

**Course Offerings**

Courses offered by the Department cover a broad range with respect to mathematical sophistication and disciplinary focus.

*Elementary courses* assume little background in mathematics and are designed for a wide audience. They aim to develop facility in quantitative reasoning, a command of basic methodology and a critical appreciation of good statistical practice in the health sciences. BIO 201 is a School-wide requirement. BIO 200 is an alternative for students who have completed one semester of calculus or have a comparable quantitative background. (For students in Health Policy and Management, HPM-BIO 219 is substituted.) The other elementary courses are BIO 111, 112 and 113.

*Intermediate courses* are designed to develop methodological skills in specific areas of application, such as epidemiology, health policy and experimental science. At least one intermediate course is a School-wide requirement for doctoral students. The intermediate courses are BIO 202, 203, 204, 205, 207, 208, 211, 214, 217, 218, 235, 251, 273, 275, 276, 277, 280, and 285.

*Advanced courses* require a background in mathematics and are primarily intended for degree candidates in Biostatistics. The advanced courses are BIO 209, 210, 220, 240, 261, 262, 263, and 274. Students may also take courses in the Department of Statistics and at the Massachusetts Institute of Technology.

Students in the Applied Biomedical Computing Program may select from the computing and statistical courses offered through the Department as well as from courses in the biological, medical and computing courses offered at the Massachusetts Institute of Technology, the Medical School, the Graduate School of Arts and Sciences, and the Graduate School of Design.

**Admission**

See specific requirements on page 23 (S.M.) and page 24 (S.D.).

**Career Outlook**

The career outlook for biostatisticians is very promising. Biostatistics graduates have secured positions in government, universities, industry, and public health centers. Statisticians are needed in the broadly defined areas of medical care, drug therapy, health maintenance, environmental control, and health care administration. Good career opportunities also exist for graduates of the Applied Biomedical Computing Program. Biomedical computer scientists are needed in health research in hospital, university, government, and industrial environments.

*Some of the courses the Department offers are described on page 126.*

# Department of Cancer Biology

M. E. Essex, D.V.M., Ph.D., Professor of Microbiology and Chairman of the Department

**Faculty**

Professors Cairns and Little; Associate Professors Eisenstadt, Haseltine and Kennedy; Assistant Professors Glimcher and Mullins; Lecturer de Thé

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Cotter, Dressler, Fiumara, Grady, Weichselbaum, and Werner; Visiting Scientist Tachibana; Research Associates Billings, Chan, Henson, Lee, Liber, Miller, Nagasawa, Orrego, Romet-Lemonne, and Umans; Consultant McGandy; Assistant Vetrovs

**Introduction**

Research in the Department of Cancer Biology is primarily involved with cancer etiology. Training programs leading to the Doctor of Science degree are emphasized. The Department also participates in the professional degree programs offered by the School, for those interested. Doctoral training areas include basic and applied research in virology, immunology, cancer biology, and radiobiology. Please see individual laboratory listings for more specific research goals.

A collegial atmosphere prevails among the faculty and students. Students are encouraged to participate in the numerous seminar series and informal discussion groups the Harvard Medical Area has to offer. Course work is available in several areas of microbiology, in biochemistry and in cell biology at the Harvard Medical School, other schools within Harvard University or at the Massachusetts Institute of Technology, in addition to the offerings of the Department and the School.

The Department also maintains a relationship with the Massachusetts State Laboratory Institute, and is involved in joint research efforts with some of our associates at that Institute.

**Degree**

Doctor of Science. (Please see degree requirements on page 24.)

**Curriculum**

Course work during the first one to two years emphasizes cancer biology, cellular and molecular biology, virology, immunology, radiation biology, and genetics. It also develops the basic skills in laboratory techniques and data handling necessary for undertaking original research. The latter part of the program involves intensive laboratory research under the guidance of a faculty adviser.

**Career Outlook**

Our recent graduates have accepted research and/or teaching positions with public and private academic institutions, with governmental agencies such as the National Institutes of Health and the Centers for Disease Control, and with private industry.

**Publication**

Emphasis is placed on publication of research in the standard research literature. In most cases this is a departmental requirement, and most of our doctoral students publish several good papers before they complete the degree.

## Research

### Laboratory of Carcinogenesis

This program offers doctoral-level training in the cellular and molecular effects of chemical carcinogenesis in preparation for research careers in cancer biology. Some areas of ongoing research in this area include study of the precise changes in DNA sequences produced by the main categories of chemical carcinogens and study of the general mechanisms of mutagenesis and DNA repair.

Information regarding the program in carcinogenesis may be obtained by writing Professor John Cairns, Director, Laboratory of Carcinogenesis, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

### Laboratory of Radiobiology

This program offers doctoral-level training in the cellular and molecular effects of radiation in preparation for research careers in radiation biology and experimental carcinogenesis. Some areas of ongoing research in the program include the study of: the induction and mutations and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents; radiation-induced DNA damage and repair processes at the cellular and molecular levels; cytogenetic effects of radiation and chemical pollutants; and the effects of radiation in human diploid cells from cancer-prone patients.

Information regarding the program in radiobiology may be obtained by writing Professor John B. Little, Director, Laboratory of Radiobiology, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

### Laboratory of Virology, Immunology and Molecular Genetics

This program offers doctoral-level training in the immunology, molecular biology and epidemiology of infectious disease agents, especially viruses associated with cancer. Some areas of ongoing research in the program include the study of: the role of viruses in the cause of cancer, including hepatitis B virus and human liver cancer, and RNA tumor viruses as causes of leukemias, lymphomas, other tumors and immunosuppressive disorders of animals and man; tumor immunology; monoclonal antibodies; the molecular biology of cancer; gene regulation; and genetic events associated with the induction of leukemia and immunosuppressive disease.

Information regarding the program in virology, immunology and molecular genetics may be obtained by writing Professor M. Essex, Chairman, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

*Some of the courses the Department offers are described on page 132.*

# Department of Environmental Science and Physiology

Joseph J. Harrington, B.C.E., A.M., Ph.D., Professor of Environmental Health Engineering in the Faculty of Public Health, Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences and Chairman of the Department

**Faculty**

Professors Brain, Ferris, Hornig, Mead, Moeller, Monson, and Spengler; Associate Professors Amdur, Burgess, Butler, Dennis, Drazen, H. A. Feldman, Loring, Speizer, and Valberg; Assistant Professors Banzett, Ellenbecker, Evans, Greaves, and Robins; Lecturers Bjarngard, Cudworth, Shapiro, Snook, and Webster; Members of the Faculty Ingram and Leith; Emeritus Professors First and Whittenberger

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Arndt, Ashford, E. L. Baker, S. Baker, Barmack, Boden, Bracken, Christiani, Ciriello, Corley, Douglass, Egan, R. Feldman, Forster, Gonzalez, Greer, Jaeger, Kantrowitz, Kern, Lakey, Landrigan, Levenstein, Levy, B. L. Murphy, R. L. H. Murphy, Oliver, Pagnotto, J. Ryan, Selby, Smith, Sprince, Storm, Travers, Varner, and Wegman; Instructor Goldman; Research Associates and Visiting Research Associates Beck, Davis, Dockery, Eisen, Hammond, Harbison, Hoppin, Kimball, Kreyling, Letz, Parod, Reid, Rudnick, P. B. Ryan, Sweeney, Walski, Wenger, Wolfson, and Yanagisawa; Visiting Scientists Demerjian and Wallace

**Introduction**

With growing public awareness of the need for environmental pollution control and worker protection, increasing attention is being focused on these problems at all levels of our society. There are five specialized programs offered by the Department of Environmental Science and Physiology. The mechanisms of action and the adverse health effects of chemical and physical factors in occupational and community settings are typical problems that are central to the Department's interests. Such research provides the basis for prevention and control.

The problems are very complex and require the insights of many specialties. The faculty and staff of the Department reflect the multidisciplinary nature of the field and include applied mathematicians, chemists, economists, engineers, epidemiologists, physicians, physiologists, physicists, and specialists in occupational health. Students and research fellows come with similarly varied backgrounds.

**Degrees**

Master of Public Health with concentration in Environmental Health Sciences; Master of Science in Environmental Health Sciences; Master of Occupational Health; Master of Science in Physiology; Doctor of Science; and Doctor of Public Health.

**Research**

The research programs include topics such as: inhalation toxicology, comparative respiratory physiology, the deposition and clearance of particles in the respiratory tract, and epidemiologic studies of working populations and community populations exposed to various toxic materials; the mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments. Other research studies include: the evaluation of exposures to air contaminants of workers in the railroad industry, meat-handling establishments and silicon carbide production facilities; development and application of personal samplers for determining

individual and population doses to specific air contaminants, including those encountered indoors; development and application of engineering methods for collection of particles and pollutant gases from industrial gas streams; numerical analyses of urban scale atmospheric transport; determination of priorities for air pollution source control; evaluation of mechanisms for the adsorption of radioactive noble gases on activated carbon; analyses of failures of air cleaning systems in nuclear power plants; development of techniques for the control of naturally occurring radon and radon daughter products in homes; and evaluation of countermeasures for protecting the public in case of a nuclear accident.

**Programs**

**Occupational Health**

Information concerning programs and degrees in Occupational Medicine and Occupational Safety and Health may be found on pages 69 and 70 under Educational Resource Center for Occupational Safety and Health.

**Physical Sciences and Engineering**

*Air Pollution Control*

**Goals** To provide education in the sciences basic to understanding air pollution research and control.

**Curriculum** Includes courses in community air pollution, health hazards of manufacturing processes, meteorological aspects of air pollution, identification and measurement of air contaminants, aerosol technology, and air and gas cleaning.

**Admission** Candidates for the program normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with a master's degree in a discipline closely related to environmental health and those with a baccalaureate degree plus two years of directly relevant experience, or three or more years of experience related to their expected degree may be able to earn the S.M. degree in one year.

**Career Outlook** Recent graduates have taken positions with federal, state or local regulatory agencies and with consulting firms, industry or universities.

*Industrial Hygiene*

**Goals** The master's program is designed to meet the demand for professional personnel with the skills and scientific knowledge that are needed to identify and control health stresses associated with the working environment — e.g., air contamination, noise, radiation, heat, pressure, etc.

**Curriculum** Generally includes recommended and required courses dealing with basic problems in occupational health and industrial environments, policy issues in occupational health, environmental control, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, human factors in occupational performance and safety, and aerosol technology.

**Admission** Acceptable candidates for the program normally have a bachelor's degree in engineering, chemistry, physics, or biology. A course in organic chemistry is required. Although this is primarily a two-year program, students with master's degrees in the above disciplines and some students with prior training or experience in related areas may be able to earn the S.M. degree in one year. It is a terminal program for most students, although a few continue toward the Doctor of Science degree.

**Career Outlook** Recent graduates have taken positions with federal, state or local regulatory agencies and with consulting firms, industry or universities.

*Environmental Health Management*

**Goals** This program is intended for those with interests in quantitative approaches for the evaluation and management of the physical environment. The emphasis is on control of environmentally induced effects on human health.

**Curriculum** Students in the program are expected to complete courses in three areas: basic environmental sciences, data analysis and inference, and decision sciences. Courses in environmental sciences may have a wide scope or may be oriented toward a specific medium (e.g., air, surface water, groundwater) or pollutant (e.g., ionizing radiation). The environmental science courses may focus on monitoring, modeling or control of pollutants — or some mixture of these elements. Courses in data analysis and inference include basic biostatistics and epidemiology as well as more advanced topics such as multiple regression and analysis of variance. The required courses in decision sciences are intended to familiarize students with basic concepts and techniques from operations management, statistical decision analysis and economics. Courses in these three basic areas are supplemented by electives. Human physiology and introductory toxicology are strongly recommended. Other electives include: environmental law, environmental and natural resource policy, environmental or regulatory economics, computer science, cancer biology, environmental toxicology, and health risk assessment.

The core courses and many electives are offered at the School of Public Health. Students may supplement their programs with courses offered through other faculties at Harvard (e.g., the Division of Applied Sciences of the Graduate School of Arts and Sciences and the Kennedy School of Government). Appropriate courses may be taken at M.I.T. as well. Students particularly interested in hazardous waste management or groundwater contamination normally take about one-third of their courses outside the School of Public Health.

**Admission** Students admitted to the master's degree program normally hold a bachelor's degree in science or engineering. Other applicants are considered, but they must demonstrate preparation in calculus, physics and chemistry. The program is usually two years in length. Students are encouraged to participate in summer internships, although this is not a requirement. Candidates with more than two years of direct, relevant experience may apply to the one-year program. Qualified students, holding appropriate undergraduate and/or graduate degrees, may be considered for admission to the doctoral program.

**Career Outlook** Recent graduates have taken technical and administrative positions with regulatory agencies, consulting firms and universities.

***Radiological Health (Radiation Protection)***

**Goals** To provide students with knowledge of the fundamentals of radiation protection. Considerable attention is given to the effects of environmental releases of radioactive materials, and the associated requirements for complying with regulations and standards.

**Curriculum** Includes recommended and required courses covering radiation protection, radiation biology, radiation instrumentation, radiation dosimetry, and aerosol technology.

**Admission** Students admitted to the program normally have bachelor's or master's degrees in physics, mathematics or engineering. Two years are normally required to earn the S.M. degree, although some students with prior training and/or experience in relevant areas may earn the degree in one year. About half the students continue toward the doctoral degree.

**Career Outlook** Recent graduates have taken positions with the nuclear power industry, hospitals, universities, research institutions, governmental regulatory agencies, and consulting architectural or engineering firms.

**Respiratory Biology**

**Goals** This program offers doctoral training in preparation for research careers in respiratory biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on two aspects of organ system physiology: respiratory mechanics and respiratory defense mechanisms. Also emphasized are inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging from molecular and cell biology to integrated organismic, environmental and comparative physiology; both normal and pathological physiology are included.

**Curriculum** Intensive course work in the first two years may include physiology, biochemistry, histology, engineering, toxicology, radiation biology, statistics, epidemiology, pathology, and immunology. The latter part of the program consists of research under the guidance of a faculty adviser. Collaborative research opportunities exist in several area institutions. (See page 23 for specific degree requirements.)

**Admission**

Intended primarily for students with prior degrees in the physical sciences, or biology with a strong physical science and mathematical component. Two years of residence at the School are generally required to earn the S.M. degree; students with prior master's degrees in related areas may earn the S.M. degree in one year. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

**Career Outlook**

Recent graduates and postdoctoral Fellows have taken positions in academic, clinical and government institutions engaging in basic and applied research and teaching in respiratory physiology and pathophysiology.

**Respiratory Epidemiology**

This program offers training at both the master's and doctoral level in preparation for research careers in respiratory epidemiology. Major work is directed toward assessing the possible effects of sulfur oxides and particulate matter on health. Other pollutants are also monitored. This has involved adults and children, and airborne material both indoors and outdoors. The research has been planned as a longitudinal study (about to enter its eleventh year), so that a considerable data base has been developed both for aerometrics and health data. Health effects are being assessed by standard questionnaires and simple tests of pulmonary function.

**Interdisciplinary Programs in Health**

Information concerning these programs and postdoctoral fellowships may be found on page 78.

*Some of the courses the Department offers are described on page 134.*

# Department of Epidemiology

Brian MacMahon, M.B., Ch.B., D.P.H., Ph.D., S.M. in Hyg., M.D., M.D. (hon.), Henry Pickering Walcott Professor of Epidemiology and Chairman of the Department

**Faculty** Professors Hutchison, Miettinen (on leave), and Monson; Associate Professors Gutensohn, Walker and Willett; Assistant Professors Hsieh and Maclure; Lecturer Klerman

**Teaching and Research Staff** Lecturers and Visiting Lecturers Boice, Cole, Cook, Cramer, Ellison, Feinleib, Finkle, Jick, Li, Morrison, Paffenbarger, and Sartwell; Instructor Boyle; Research Associates Goldman, Krolewski, Yen (on leave), and Zierler

**Introduction** The major objective of the Department is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the malignant neoplasms, the cardiovascular disorders, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

**Degrees** Master of Science in Epidemiology; Doctor of Science; and Doctor of Public Health.

**Research** Research programs in the Department provide faculty members and graduate students the opportunity to work together exploring the following areas:

— the role of viruses in the etiology of cancer
— the etiology and natural history of Hodgkin's disease
— the relationship between thyroid disease treatment and breast cancer
— the relationship between exposure to chemicals in the workplace and the development of cancer
— the health effects of oral contraceptives
— the study of the relationship of hormonal patterns and breast cancer
— etiology of non-Hodgkin's lymphoma, with emphasis on immune system disturbances
— the relationship of diet and risk of cancer
— factors in youth predisposing to chronic disease

## Programs

**Goals** The master's program is intended to provide students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The doctoral programs are designed for persons who plan careers of research or teaching in epidemiology.

**Curriculum** The one-year research training program for the S.M. degree includes most of the courses offered by the Department, plus courses in principles of biostatistics, statistical methods in research and computing principles and methods (which are offered by the Department of Biostatistics). Additional formal courses in areas of special interest and/or supervised research comprise the remainder of the program. The S.D.

program is of four to five years' duration for persons holding baccalaureate degrees. For persons holding relevant doctoral degrees, however, the program is shorter, usually three years in length. Unless course work equivalent to that described above for the S.M. degree has been taken previously, most of the first two years of a doctoral program is occupied with courses. Subsequently, completion of a thesis and experience as a teaching assistant are the principal components. The content of the Dr.P.H. program is identical to that of the S.D. program and will vary in length, usually from two to five years, depending on the individual's background and progress with the thesis component. (Please see page 24 for more specific degree requirements.)

**Admission**

Ordinarily, candidates for the S.M. program are physicians, veterinarians or dentists. For qualified students, the period of research training may be extended by admission to either of the doctoral programs offered by the School, or by admission to special student status. Most of the training beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

The Department considers applications for direct admission to doctoral candidacy (S.D. degree) from persons holding baccalaureate degrees with strong backgrounds in biology and mathematics.

The Dr.P.H. program is available to persons holding the M.P.H. degree.

**Career Outlook**

Some of the positions recent graduates have taken: officer in Epidemic Intelligence Service, Centers for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.

*Some of the courses the Department offers are described on page 141.*

*Dr. Nancy Gutensohn, Assistant Professor of Epidemiology.*

# Department of Health Policy and Management

Frederick Mosteller, S.B., S.M., A.M., Ph.D., S.D. (hon.), S.S.D. (hon.), Roger Irving Lee Professor of Mathematical Statistics and Chairman of the Department

**Faculty**

Professors and Visiting Professors Chalmers, Chen, Curran, Fineberg, Hiatt, Hsiao, Richmond, Roberts, Rosenkrantz, and Weinstein; Associate Professors Shepard and Stason; Assistant Professors J. B. Brown, Graham, Kane, Mariner, Sapienza, and Thomas; Lecturers Barnes, Barrett, Braun, J. L. Brown, P. Feldman, Hemenway, Henn, Kasten, Palmer, Reich, Segall, and Sherman; Members of the Faculty Frazier, Hedley-Whyte and Herzlinger

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Allen, Antczak, Bander, Bentkover, Berarducci, Berwick, Bishoff, Bloem, Blumenthal, Bossert, Burchfield, Bycoff, Caplan, Cohen, Crampton, Cupples, DeFuria, C. Douglass, Dumbaugh, Field, Gougeon, Hatch, Hester, Hobart, Hoffman, Holden, Irish, Johnson, Komaroff, Koplan, Landy, Lee, Liang, Lorch, Marra, Mollica, Montminy, Morley, Morris, Moseley, Munier, Nesson, Pass, Pyle, Rabkin, Rosenberg, Rosenthal, Rozovsky, Sands, Shapiro, Sheldon, Sohl, Strange, Stranova, Taylor, Thompson, Trevelyan, Valachovic, Wathne, J. Winsten, and M. Winsten; Instructors Corrillo and Marks; Research Associates Gerteis and Saltman

**Introduction**

The Department of Health Policy and Management is concerned with the allocation and management of resources to deal with public health problems. Such problems may arise in the context of public policy decisions where choices must be made among various programs and policies. Activities must then be designed and implemented, whether the problem area is the health care delivery system, environmental or occupational health, etc. Alternatively, the problem may be set within an individual institution such as a hospital or community health center, or a public health agency where a manager must choose among competing programs and activities. Furthermore, in any setting, effective management is essential if objectives are to be achieved with the limited resources that are available.

The Department offers a two-year master's program in health policy and management, two one-year master's programs in health services administration and a doctoral program. The Department's faculty is interdisciplinary, including economists, political scientists, physicians, decision analysts, management specialists, and lawyers. Students in any of these programs may choose electives from courses offered at the School of Public Health, by other faculties within the University or at the Massachusetts Institute of Technology.

**Degrees**

Master of Science in Health Policy and Management; Master of Science in Health Services Administration; Master of Public Health with concentration in Health Services Administration; Doctor of Science; and Doctor of Public Health.

## Programs

### Master of Science in Health Policy and Management

The two-year program in Health Policy and Management is designed to provide a foundation of professional training for managers, policy analysts, planners, and others who intend to devote their careers to working on public health problems. The program has been designed

around four key elements: 1) a dual focus on policy and management; 2) an emphasis on both skills and concepts; 3) a grounding in the substance of public health problems; and 4) a curriculum combining academic and clinical activities.

The program is based on the premise that training in an academic setting must be complemented by experience in problem-solving situations. The curriculum is updated regularly and is applied to practical situations by means of a required summer internship program and an applied research program.

Dr. Diana Barrett is Director of the Graduate Program in Health Policy and Management.

**Curriculum**

The curriculum for the Health Policy and Management program has been tailored to reinforce the above-described philosophy. There are four important and interrelated elements:

*Required Core*

A set of required core courses comprises the first year of each student's two-year program. These core courses provide the basic analytic skills and knowledge needed by professionals serving in both policy and management roles in the health field. Subjects covered include: quantitative methods, particularly epidemiology (EPI 201a or EPI 221a) and biostatistics (HPM-BIO 219b, 219c, 219d); essential management skills (HPM 220a,b/220c,d); an introduction to policy analysis, including microeconomics (HPM 206a,b), decision analysis (HPM/BIO 280c), and political and bureaucratic analysis (HPM 250d); and substantive public health issues (HPM 240a). Students may be exempted from those core requirements in which they demonstrate prior proficiency.

*Summer Internship*

A required summer internship between the first and second years allows students to apply the skills and knowledge gained from the first year, and to acquire further understanding of career possibilities in the health care field.

*Flexible Second-Year Curriculum*

A flexible second-year curriculum is designed by each student in conjunction with his or her academic and clinical adviser. Maximum flexibility is provided in order to allow students to pursue their own particular areas of interest as fully as possible.

Typically, each student's second-year program of study concentrates on one of two primary skill areas (either policy or management) and in a single substantive health area (such as health services, nutrition, environment, international health, or population). Diverse course offerings allow students to develop expertise in their primary areas of concentration.

*Applied Research Program*

As part of their second-year activities, students are required to participate in an Applied Research Program. This program includes a research project carried out in conjunction with a local public health organization or agency.

*Curriculum Tracks*

In addition to the four basic elements described above, the program includes curriculum tracks for physicians and dentists, and for students interested in environmental health. These tracks combine the basic core disciplines of the program with courses directed toward students' specific interests. The Medical/Dental Track contains course work in Clinical Decision Analysis, Principles of Clinical Trials and others, and offers the option of receiving the M.P.H. degree concurrently (see pages 17, 47-48 for requirements). The Environmental Health Track contains course work in the Principles of Environmental Health and Environmental Health Policy Analysis. All other students are automatically enrolled in the General Track, which contains course work in Health Care Delivery in the U.S., History and Sociology; and the Health Care Delivery System, Political and Economic Analysis. While remaining in the General Track, students primarily interested in international health may, with the consent of the Program Director, substitute internationally oriented courses for these two U.S. focused courses. Such courses might include Health Services in Developing Countries, Health Planning in Developing Countries and Program Implementation in Developing Countries. Applicants interested in a particular track should so note on their application.

**Admission**

The program seeks candidates whose academic record, personal characteristics and work experience suggest outstanding potential in the areas of health policy and management. Enrollment is limited to 50 or fewer students per year in order to allow for maximum interaction between students and faculty, both inside and outside the classroom. All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. The program includes academically strong candidates from a wide variety of undergraduate fields. Normally, candidates have at least one year of pertinent post-baccalaureate work experience in the health field, but exceptions are sometimes made for particularly outstanding applicants. (Please see Degree Requirements for Admission, page 21, and Admissions, page 89.)

Deferred admissions are available for a limited number of applicants who demonstrate strong potential in the field, but who have not had work-related exposure to the health care system. Students who receive deferred admissions status are expected to work within the health system, in a position approved by the program, for a minimum of one year before matriculating. Applicants whose preparation appears deficient in some area, e.g., quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.

One of the goals of the School of Public Health is to address the health-related problems of the underserved, both in this country and abroad. Accordingly, the program is particularly interested in receiving applications from individuals whose special concerns extend to people in inner cities, rural areas, developing countries, and other locations where such problems exist.

**Career Outlook**

The program has developed an effective job placement mechanism for its students, utilizing academic and clinical faculty, program alumni and the resources of the School's counseling office. Additionally, a network of contacts has been developed with potential employers throughout the country and with professionals in a wide variety of executive-level positions who have attended the School's continuing education courses. Examples of positions secured by program graduates include: director of a community hospital; administrative director of a primary care center; director of a certificate of need program; analyst in a state regulatory agency; planner in HHS; director of a state commission on the handicapped; analyst in the Congressional Budget Office; and economist/planner with a health maintenance organization.

**Master of Science in Health Services Administration**

The one-year Master of Science in Health Services Administration program is designed to address the needs of individuals with advanced degrees in health or health-related fields, including law, who wish to specialize in health services in the areas of health policy, planning, regulation, and/or management. Students are required to concentrate their studies in either policy or management, while at the same time attaining a basic grounding in the general area of health policy and management. Curriculum options are also available for students interested in international health. In exceptional cases, applicants without a prior advanced degree, but with extensive, relevant policy and/or management experience (8-10 years) may be eligible for admission.

Dr. Herbert Sherman is the Director of the Master's Programs in Health Services Administration.

**Curriculum**

The curriculum for the Master of Science in Health Services Administration includes a required core for all students, departmental course work in a student's area of concentration chosen from offerings within the Department, and several electives either within or outside the Department. The curriculum totals 40 units or more during one academic year.

A total of 10.0 units comprises the required core:

EPI 201a Principles of Epidemiology (2.5 units) *or*
EPI 221a Applications of Epidemiology in Public Health (2.5 units)
HPM 240a Toward an Agenda for Public Health (2.5 units)
HPM 300c,d Applied Research Tutorial (5.0 units)

The Department offers four curriculum options, adding course work to the required core: *Policy Option:* add HPM/BIO 219b, 219c, 219d, HPM 221a,b, HPM 206a,b (or 205a,b), HPM 280c, and HPM 250d; *Management Option:* add HPM/BIO 219b, 219c, 219d, HPM 220a,b/220c,d, HPM 205a,b

(or 206a,b); *International Option:* add BIO 200a,b or BIO 201a,b, HPM 205a,b (or 206a,b), HPM/POP 262c,d, HPM 266d; *Option for Lawyers:* add BIO 200a,b or BIO 201a,b, HPM 221a,b, HPM 257b, HPM 254c, HPM 258d. (See M.P.H. with a concentration in Health Services Administration *Curriculum* for a discussion of the options.)

With the exception of the Applied Research Tutorial, students may be exempted from those requirements in which they demonstrate prior proficiency. The Tutorial consists of the preparation of a written report in the student's area of concentration, focusing on a topic of interest to both the student and a member of the Department's faculty. The report format may range from a case study to a research paper, and occasionally, depending on the student's interests, may include field work.

**Admission**

The program seeks candidates who hold graduate professional degrees and have some experience in health services.

Typical applicants to the program would be professionals in public health-related disciplines who expect to devote a substantial portion of time in their careers to health policy and/or management issues; and lawyers who are interested in health law, patient's rights and health planning and regulation.

The program is also designed to satisfy similar needs of health professionals who do not necessarily hold an advanced degree, but who have eight to ten years' work experience in the health services area with a high degree of responsibility, and who wish to undertake course work in their areas of specialization.

*All* applicants must demonstrate through course work and aptitude test performance (GRE, MCAT, DAT, or LSAT) the ability to master the quantitative and analytic content of the program. Please see Admissions, page 89.

**Master of Public Health with concentration in Health Services Administration**

The one-year Master of Public Health is a School-wide program designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. By concentrating in Health Services Administration, a student commits him/herself to further study of issues in health policy, planning and/or management. Such students are provided with academic advisers chosen from Department faculty.

Dr. Herbert Sherman is Director of the Master's Programs in Health Services Administration.

**Curriculum**

Further information on the core curriculum for the School-wide M.P.H program is described on page 17 of this *Register.*

The Health Policy and Management Department offers four curriculum options designed to supplement the School-wide M.P.H. Program: Policy, Management, International, and Lawyers. In each instance, the option contains the required M.P.H. core or allowable substitutions,

along with some required HP&M courses. Applicants interested in one of these four options should so indicate on their applications, and in their statements of objectives should describe the nature of their interest in health policy and management. Applicants should also complete the "Statement of Responsibility" portion of the application.

To the School's M.P.H. requirements, the Department adds (or substitutes) the following: *Policy Option:* add HPM 240a, HPM 206a,b (or 205a,b), HPM/BIO 280c, HPM 250d; substitute HPM/BIO 219b, 219c, 219d for BIO 200a,b or BIO 201a,b; *Management Option:* add HPM 240a, HPM 205a,b (or 206a,b); substitute HPM/BIO 219b, 219c, 219d for BIO 200a,b or BIO 201a,b, and HPM 220a,b/220c,d for HPM 221a,b; *International Option:* add HPM 240a, HPM 205a,b (or 206a,b), HPM 262c,d, HPM 266d; *Option for Lawyers:* add HPM 240a, HPM 257b, HPM 254c, HPM 258d.

The Policy Option includes course work on decision theory and benefit-cost analysis, and on the implementation of health policies and programs.

The Management Option substitutes the year-long Administrative Systems course for the one-semester Managing Health Delivery Institutions course, focusing on the development of concrete management skills, in addition to a broad overview of the field of management.

The options for lawyers and students interested in international health offer students a policy or management perspective while allowing the flexibility needed to design an appropriate academic program of study outside the Department.

Students choosing the International Option are expected to take course work on a variety of health issues related to their interests and experience in developing countries. Especially important will be the electives that stress the application of analytic techniques to program design, implementation and evaluation.

The Option for Lawyers adds a sequence of courses that reviews legal and professional methods of standard setting for medical care programs and loss control. Lawyers with other specialties (e.g., environmental health law) may substitute, with departmental approval, 7.5 units of other appropriate law and/or policy course work for HPM 254, 257 and 258.

Further information about these courses, rationales for substitutions and help in choosing between economics courses is available through the HP&M Programs office. Please note that the substitutions of HPM/BIO 219b, 219c, 219d and HPM 220a,b/220c,d must be taken in their entirety.

**Admission**

Applicants must satisfy the requirements for admission to the M.P.H School-wide program as listed on page 16 of this *Register. All* applicants interested in a concentration in Health Services Administration must demonstrate through course work and aptitude test performance (GRE, MCAT, DAT, or LSAT) the ability to master the quantitative and analytic content of the program.

*Dr. Stephen Thomas.*

**Doctor of Science/Doctor of Public Health**

The doctoral program concentrates on preparing its graduates to perform research at the professional level. More than half the program graduates accept positions as faculty members in universities. Others join state or federal agencies or private research organizations. The degree of Doctor of Public Health is reserved for candidates with prior professional training.

Dr. Frederick Mosteller is Director of the doctoral programs.

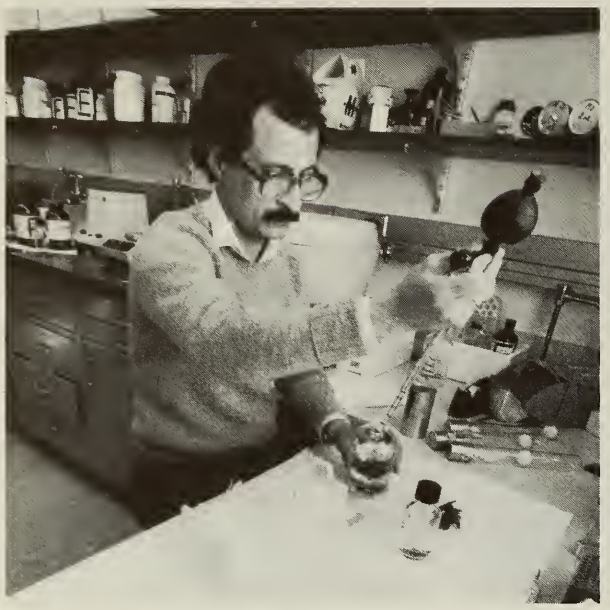
**Curriculum**

Required courses cover health care processes and institutions, economics, statistical methods, management, and formal analytic methods. Students select both disciplinary and substantive area majors and minors. Disciplinary areas include economics, management sciences, political science, program evaluation and experimental design, decision sciences, and statistics. Substantive areas include disease prevention and health promotion, health care delivery, health resource allocation — capital and human — and technology assessment. A doctoral seminar is devoted to research methods. Doctoral dissertations comprising original research are advised by committees of three or more faculty members.

**Admission**

Preference is given to applicants with strong aptitude or competence in a quantitative discipline (demonstrated through course work, work experience and aptitude test performance on the GRE, though physicians or dentists may submit the MCAT or DAT), experience in the health sector, ability to organize and perform independent projects, and good interpersonal skills. Direct admission to the doctoral program is generally reserved for persons with relevant graduate education. Persons without such education may in exceptional circumstances be directly admitted, but will generally be referred to a master's program from which their doctoral application may be made.

*Some of the courses the Department offers are described on page 144.*



*Dr. Mario Rodriguez, research Fellow in the Department of Tropical Public Health.*

*Dr. Ann Kennedy, Associate Professor of Radiobiology.*

*Dr. Rose Frisch, Associate Professor of Population Studies.*

# Department of Maternal and Child Health

Isabelle Valadian, M.D., M.P.H., Professor of Maternal and Child Health and Chairman of the Department

**Faculty** Professors Curran and Richmond; Associate Professors Branch, Deykin and D. Walker; Assistant Professors Gardner and Sachs; Lecturers Crocker, and Dwyer; Emeritus Professor Reed

**Teaching and Research Staff** Lecturers and Visiting Lecturers Gold, Hollinshead, Newberger, and Stubblefield; Research Associates Butler and Harkness

**Introduction** The Department of Maternal and Child Health is concerned with the human life cycle, factors which affect individuals' life-long health status and the interventions and services needed to promote health.

**Degrees** Master of Public Health with concentration in Maternal and Child Health; Master of Science in Maternal and Child Health; Doctor of Science; and Doctor of Public Health.

## Programs

**Goals/ Curriculum** The major objectives of the Department are to provide in-depth understanding of the physical, social and psychological determinants of health at various stages of the human life cycle and to promote application of this knowledge in health programs. Specifically, the curriculum emphasizes:

1. the developing individual and his or her changing physical, psychological, social, and cognitive strengths from conception to senescence within the context of family and community;
2. the examination of those health, welfare and related services which are currently available and those which could be instituted to meet the health needs of individuals, including those with chronic illness, handicapping or other special conditions;
3. the roles of governmental bodies, health agencies and voluntary and consumer groups in the organization and delivery of health and social services at all levels, e.g., international, national, state, and local;
4. the interface of law with health and related systems, which has varied implications for service and research at different stages of life;
5. the skills of policy formulation, planning, management, and evaluation in MCH programs.

**Research** The research of the Department involves a broad range of interests. The Longitudinal Studies of Child Health and Development, started in 1930, have been expanded to investigate the patterns of growth, maturation and behavioral, social and nutritional changes in an aging cohort. These data have facilitated the study of variables influencing health status at various stages of life and related adult health to child health and development. Investigation of patterns of physical and behavioral development during childhood and adolescence have particular emphasis on the development of statistical methods for analyzing processes of growth and development, and the utilization of these methods in health program planning and evaluation.

The interface between health and social well-being is a major concern of the Department. Data from community-wide surveys on the availability and utilization of child health services in western Massachusetts and in an urban Michigan city have been collected and are being analyzed and disseminated. Another study evaluates an intervention program designed to reduce the occurrence of self-destructive or suicidal behavior among adolescents.

Doctoral students' research activities represent a range of interests in areas of health, development and service delivery. Recent doctoral studies have included topics such as motor development of children with Downs Syndrome, an intervention program for low-birthweight infants and obstetric risk assessment.

Research endeavors by Department faculty and students include a study of neurological and cognitive sequelae of early infancy apnea; an assessment of developmental intervention of high risk infants; studies on adolescent depression and suicide; a multidisciplinary, intergenerational study of school-aged pregnancy and parenting; and studies of family functioning in families with a child who has a chronic illness.

**Admission**

Professionals with advanced degrees from health disciplines (including medicine, dentistry, nursing, social work, nutrition, psychology, health education) and other related areas such as law, education and anthropology are eligible for the following degree programs:

The M.P.H. degree with concentration in MCH is a one-year program designed primarily for established health professionals who desire to broaden their knowledge of public health policy and strategies and their specific application to the area of maternal and child health. To be eligible for this degree, applicants must meet eligibility requirements specified by the general M.P.H. program, and in addition must have had relevant prior experience in maternal and child health.

Candidates admitted to the M.P.H. program in MCH must fulfill the core curriculum of the M.P.H. program described on page 17 and must take MCH 204a,b (5 credits), at least 2.5 credits in MCH 205 and MCH 206, *or* MCH 208 (case study courses), and a minimum of 7.5 credits from other MCH formal courses for a total of 15 MCH course credits. It is expected that all students in this program will take courses leading to an understanding of normative physical and cognitive development, of maternal and child health services and of the legislation supporting health and social services in maternal and child health. Students who wish to be excused from specific courses covering this material may petition the Department, which will assess the student's proficiency in the area and may grant specific course waivers.

The Master of Science degree in Maternal and Child Health (S.M. in MCH) is designed for students who wish to focus in depth on maternal and child health. The Department offers both a one-year (40 credits) and a two-year (80 credits) program.

Applicants eligible for the one-year program are established practitioners or researchers with at least a prior master's degree in a related field

(medicine, nursing, social work, nutrition, physical therapy, education, or anthropology). Applicants who have a master's degree in a field unrelated to health (e.g., statistics, education, sociology) or who have a bachelor's degree in a health-related field and exceptional relevant work experience are eligible for consideration for the two-year master's program in MCH.

Candidates for the one-year master's program must fulfill at least 20 credit units in departmental offerings, whereas candidates for the two-year program must fulfill at least 30 credit units in departmental offerings. At the discretion of the Chairman of the Department, courses offered by other parts of the University may, on occasion, be substituted to fulfill this requirement.

Applicants to the doctoral program in the Department are required to have a prior advanced degree in a health field related to maternal and child health. Such applicants are judged on the basis of past academic performance, especially in the quantitative sciences, relevant experience, stated career goals, and interest in an area of research consonant with the goals of the Department.

**Career Outlook**

The master's degree prepares candidates for positions where they will be instrumental in initiating and reshaping public health practice at federal, state and local levels, assuming responsibility for advocating, formulating policies and organizing and administering health care services for women, children, youth, and families. The doctoral program trains researchers and prepares professionals for academic positions.

A limited number of fellowships may be available to master's degree candidates who concentrate in the area of MCH and who are U.S. citizens.

*Some of the courses the Department offers are described on page 152.*

# Department of Nutrition

Peter Goldman, B. Eng. Phys., A.M., M.D., Professor of Health Sciences in Nutrition and Acting Chairman of the Department

**Faculty** Professors Antoniades, Geyer and Lown; Associate Professor Verrier; Assistant Professors Franceschi, Owen and Sul; Lecturers Herrera-Acena, Reinhold and Witschi; Professors Emeriti Hegsted and Stare

**Teaching and Research Staff** Visiting Lecturer Samonds; Lecturers Cheung, Dichter, Hayes, Nicolosi, and Overholt; Visiting Research Associate Bartholow; Research Associates Ausman, Blatt, Chu, Graboys, Lampert, Lynch, Pantazis, Podrid, Raeder, Santikarn, and Super; Consultant McGandy; Assistant Gallagher

**Introduction** The Department of Nutrition provides training and research opportunities in basic science relating to nutrition as well as in practical aspects of nutrition as they affect public health. Nutrition policy and the evaluation of nutritional interventions have been a long-standing interest of the Department, dealing with problems in Latin America, Africa and Asia as well as in the United States.

**Degrees** Master of Public Health with concentration in Nutrition; Doctor of Science; joint Doctor of Science with Epidemiology; and Doctor of Public Health.

**Research** Research is conducted on problems extending from those in molecular biology to others in human epidemiology. Both the regulation of cell growth by hormonal growth factors and the mechanisms of such regulation are being studied in tissue culture. Special emphasis is being given to the role of phosphorylated inositol derivatives in these regulatory pathways, and to the mechanism by which 1,25-dihydroxyvitamin $D_3$ inhibits the action of the hormonal growth factors. A full understanding of the regulation of cellular metabolism by means of insulin and nutrients is being sought in other studies. The metabolism of nutrients and drugs by the gut flora is being pursued utilizing a variety of analytical techniques including mass spectrometry. State-of-the-art mass spectrometry is also being employed to study the structure of complex carbohydrates and glycoproteins. Extensive research is being carried out on pharmacological and psychological aspects of sudden cardiac death. Preparations are being developed and evaluated that transport oxygen intravenously without dependence on red cells. The use of computers for interactive dietary analysis and counseling is being developed and evaluated. Nutrition programs and methodology are being evaluated to discern their effects in combating the mental and physical consequences of malnutrition. Research activities of the faculty are listed under course numbers NUT 351-369.

## Programs

**Goals** The Doctor of Science degree program in Nutritional Biochemistry is designed to train highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. By utilizing a number of scientific disciplines and engaging in appropriate

research, students learn and use the latest techniques in biochemistry, physiology and related fields. The research, whether basic or applied, is relevant to human health. The joint Doctor of Science degree in the Departments of Nutrition and Epidemiology furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever-increasing number of important nutritional problems. Applicants interested in earning the Doctor of Public Health degree in an area dealing with nutrition should contact the Department for information.

**Curriculum**

Students accepted to the S.D. program in Nutritional Biochemistry are required to take graduate courses in biochemistry, physiology, epidemiology, biostatistics, and the following Nutrition courses: Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b/204c,d), Biochemistry and Physiology of Nutrition (NUT 205c,d), and Research Techniques in Nutritional Biochemistry (NUT 214a,b/214c,d). In addition, 5.0 units of other formal Nutrition courses are required for graduation. Formal course work also must apply to one minor field in biochemistry and the other chosen from the other basic medical sciences. Research is begun during the first year; a thesis must be completed within the period prescribed by the School (see page 24).

For the joint S.D. degree with Epidemiology, the student must satisfy the course requirements for the Doctor of Science programs in both Departments and must select a minor field that satisfies both Departments. In this program, the thesis will concern a topic in both Nutrition and Epidemiology.

Students in the M.P.H. program who concentrate in Nutrition are required to take Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b/204c,d) and at least one other course offered by the Department. The requirements for the Dr.P.H. degree are the same as those given for the S.D. degree, but the candidate must hold an M.P.H. degree.

**Admission**

Students with a bachelor's or master's degree may apply for admission to the S.D. degree program in Nutritional Biochemistry. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for admission. Admission for the joint S.D. degree requires a strong background in biology and mathematics. Approval by both the Departments of Nutrition and Epidemiology is necessary. Applicants interested in this program should contact the Department of Nutrition before formally applying. Applicants for the Master of Public Health or Doctor of Public Health degree with emphasis in Nutrition should communicate with the Department prior to filing an application.

**Career Outlook**

The following are some positions recent graduates have taken: assistant professor of Biochemistry at a university; assistant professor and research associate at schools of medicine; postdoctoral research Fellows in medical centers and universities; nutrition research director at a major food company; nutritionist at a school of public health; director of nutrition support service in a medical center; community nutritionist for a state health project; local health clinic administrator; food analytical chemist for industrial firm; nutritionist for federal nutrition evaluation agency; and nutrition educator for a national Tunisian institute.

*Some of the courses the Department offers are described on page 155.*

*Dr. Robert Geyer, Professor of Nutrition.*

# Department of Population Sciences

David E. Bell, A.B., A.M., LL.D. (hon.), Clarence James Gamble Professor of Population Sciences and International Health and Chairman of the Department

**Faculty**

Professors and Senior Lecturer Alonso, Dyck, J. Harrington, Levins, Nichols, Salhanick, and Wyon; Associate Professors and Visiting Associate Professors Frisch, Potter and Stark; Assistant Professor Larson; Lecturers Berggren, Hareven and Mertens; Member of the Faculty R. Lewontin

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Chen, Guerrero, Harkness, Hausman, Lane, McIntosh, and Wray; Senior Research Associate Yerganian; Research Associates and Visiting Research Associates Himmelstein, Holtrop, Hunt, S. Lewontin, Makhoul, Puccia, Seeley, Whipple, and A. Wolfson; Consultants Gamble, Goldstein and C. Thomas

**Introduction**

Acting under the conviction that rapid population growth was thwarting efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society, the School of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations among population structure, health and welfare, and social change in both developing and industrialized countries.

**Degrees**

Master of Public Health with concentration in Population Sciences; Master of Science in Population Sciences; Doctor of Science; and Doctor of Public Health.

**Research**

Some research activities of the Department are: working toward a better understanding of the biochemical and endocrinologic mechanisms controlling fertility; studying the long-term impact of demographic changes within the United States; examining the interactions of fertility, income distribution and other aspects of socio-economic development; pursuing research applied to aspects of family planning and the interactions of fertility, nutrition and infectious diseases; continuing studies leading to community diagnoses of causes of rates of birth, death and migrations; studying biological aspects of population programs; studies of ethical aspects of population policies and programs; analyzing data collected in field studies in developing countries, including studies of mortality, morbidity, nutrition status, fertility, and impact of programs; examining factors that might improve food production; and mathematical and experimental study of human ecosystems.

## Programs

**Goals**

There is wide variability among the programs of individual candidates, reflecting the diversity of the students' backgrounds, national origins, previous education, areas of professional concern, and career goals. Given these varied curriculum needs, the overall goals of the program are to develop sophistication in data and information management and evaluation, as well as to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care.

**Curriculum**

Faculty affiliated with the Department are specialists in demography, ethics, epidemiology, economics, sociology, ecology, genetics, and medicine. The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers or educators. Programs of study are offered in these areas: population, health and nutrition; the design, management and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; and reproductive biomedicine. Although the Department offers a very flexible program, approximately half of the S.M. students are from or are primarily interested in health and population problems of developing countries. (Please refer to page 23 for specific degree requirements.)

For more information about the field visit to Haiti (see page 150), please address inquiries to the Department of Population Sciences, *Field Studies*, 665 Huntington Avenue, Boston, MA 02115. Telephone (617) 732-1232.

**Admission**

Students with bachelor's degrees in biological and/or social sciences, or in other population-related fields, are generally expected to spend two years in residence toward the S.M. degree. Students with prior master's or higher degrees, or extensive work experience, generally complete study toward the S.M. degree in one year. Approximately one-fourth of those who complete the S.M. degree enter the doctoral program.

**Career Outlook**

Some positions recent graduates have taken are: director of a university center for population studies; principal statistician; executive secretary of an international committee on applied research in population; president of a medical services consultants group; medical director of a planned parenthood association; director of a medical clinic; a program officer for U.N. Fund for Population Activities; a UNFPA coordinator; a population intern for USAID; and an associate program officer in Health and Nutrition for UNICEF.

*Some of the courses the Department offers are described on page 158.*

## Laboratory of Toxicology

Armen H. Tashjian, Jr., M.D., Professor of Toxicology, Professor of Pharmacology and Director of the Laboratory

**Faculty**

Associate Professors Eisenstadt and Schonbrunn; Assistant Professors Rice, Samson and Toscano; Lecturer Ofner

**Research and Teaching Staff**

Visiting Lecturer Greenlee; Visiting Scientist Krug; Research Associate Voelkel

**Introduction**

Toxicology is the study of the injurious effects of chemicals. The scope of modern toxicology is broad and depends on the integration of knowledge and techniques from the medical, biological, chemical, and physical sciences. The faculty and staff of the Laboratory reflect the multidisciplinary aspects of toxicology.

Some of the areas in which the faculty of the Laboratory are conducting research include: receptor mediated toxicity, tumor promotion, site specific mutagenesis, biochemical regulation of cellular toxicity, DNA repair pathways, mechanisms of dioxin action and toxicity, and development and use of animal and human cell culture models.

The research and training program in toxicology provides students with knowledge in the following areas: health implications of environmental chemicals; interactions of toxic agents with a variety of cellular systems; biochemical mechanisms of toxicity; identification of toxic environmental chemicals; and prevention or reversal of adverse effects, where possible.

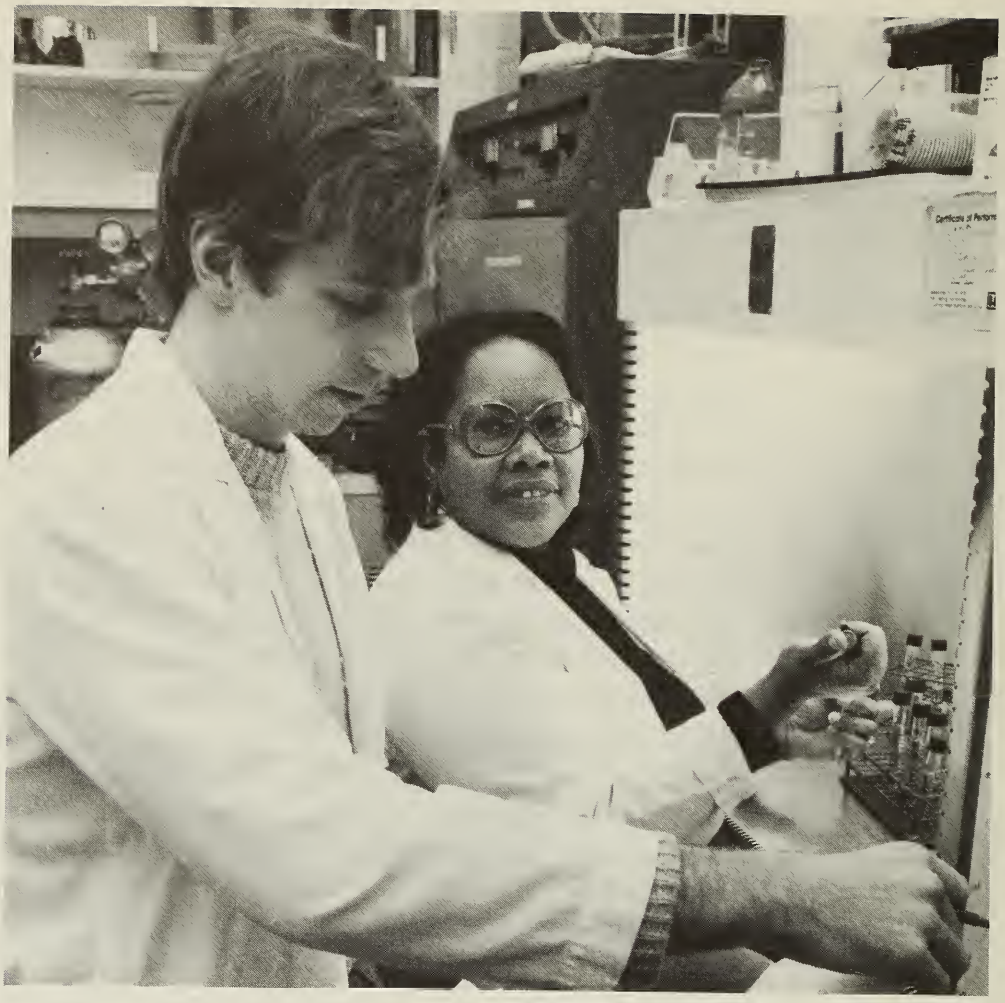
Students have the opportunity to broaden their research skills by rotating through at least three different laboratories for eight weeks each. The laboratory rotation experience is under the supervision of each laboratory head and enables the student to become familiar with a variety of laboratory research problems and techniques. At the end of each rotation, the student prepares a brief written report and gives an oral presentation. Students are encouraged to participate in weekly faculty-supervised journal clubs and laboratory research meetings. Students who are well into their thesis research are encouraged to present their research at appropriate regional and national scientific meetings.

**Degrees**

There are two doctoral programs offered: the Doctor of Science in the Faculty of Public Health and the Doctor of Philosophy in Pharmacology (Toxicology) undertaken jointly with the Department of Pharmacology through the Division of Medical Sciences at Harvard Medical School. The degree granted is determined by route of entry; however, the requirements and curriculum are identical.

**Curriculum**

The first year is usually devoted to course work. Courses are taken at the School of Public Health, within the Division of Medical Sciences, and at Harvard University in Cambridge. Appropriate courses also may be taken at MIT. Students are expected to pass a qualifying examination before the end of the fourth semester. Thesis research for the S.D. or Ph.D. degree should usually be completed in a total of four to five years in residence. The Ph.D. degree is granted by the Faculty of Arts and Sciences; the S.D. degree is granted by the Faculty of Public Health.



*Carl Boland and Joan Joseph.*

**Admission**

Students should have demonstrated knowledge of organic, physical and biological chemistry, general biology, physics, and calculus. There is no language requirement. A personal interview is strongly encouraged. The Graduate Record Examination is required.

Information regarding the program in toxicology may be obtained by writing Professor Armen H. Tashjian, Jr., Director, Laboratory of Toxicology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

**Career Outlook**

Upon receipt of the doctoral degree, it is expected that most students will take a period of postdoctoral fellowship training prior to entering a career in research in an academic institution, in government service or in industry.

*Some of the courses the Laboratory offers are described on page 162.*

# Department of Tropical Public Health

John R. David, A.B., M.D., A.M. (hon.), John LaPorte Given Professor of Tropical Public Health and Chairman of the Department

**Faculty**

Professors Chernin, Pan and Spielman; Visiting Professor Gitler; Assistant Professors Jungery, Ribeiro and Wirth; Lecturers Cash and Koch-Weser; Member of the Faculty Piessens; Emeritus Professor Weller

**Teaching and Research Staff**

Lecturers and Visiting Lecturers Arias, W. Berggren, Boyer, Buck, Dammin, Fendall, Foege, Hoff, Hommel, Hopkins, Kaiser, Mata, Miller, Morrow, Moschella, Mott, Neva, Nussenzweig, Pereira, Popenoe, Schrater, Sleigh, Todd, von Lichtenberg, Weisfeld and P. Weller; Instructor Maguire; Research Associates French, Fuhrman, Landfear, Piesman and Rossignol

**Introduction**

Despite the changing nature of the environment in tropical regions of the world, infectious diseases remain of paramount importance. Within the Department of Tropical Public Health, research and teaching efforts center on the ecological and biological aspects of helminthic and protozoal diseases, and on their mode of transmission. The basic course, Tropical Public Health 201a, is designed to provide students in the Master of Public Health program with knowledge regarding major parasitic diseases and to emphasize their epidemiology and control. Other courses deal selectively with various aspects of parasitism and emphasize the biology, immunology, molecular biology, vector biology, and pathology associated with these organisms. Although ecological, epidemiological, political, and social aspects relevant to control of infectious agents are integrated into the teaching programs, the focus of the Department and its research remains primarily on the biological aspects of the host-parasite relationship.

The resolution of the health problems of tropical areas requires a multidisciplinary approach involving a considered appraisal of human resources, as well as relevant social, economic and political factors. The student concentrating in the Department in preparation for a career in the field of international health should seek, in addition to departmental courses, broadened experience in other course work which deals specifically with these aspects of public health.

**Degrees**

Master of Public Health with concentration in Tropical Public Health; Master of Science in Tropical Public Health; and Doctor of Science.

**Research**

The investigative program in the Department currently deals with protozoa, helminths, and mycobacteria. Studies on cell biology, immunology, molecular biology, and pathology of malaria, Leishmania, trypanosomes, schistosomes, filaria, Onchocerca, amoeba, babesia, and mycobacteria are in progress. Investigation of insect vectors including mosquitoes, ticks, and sandflies comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Science level. The doctoral degree applicant should, if possible, obtain the necessary medical science background prior to enrollment. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

## Programs

### Tropical Public Health

**Goals**

The program has the following goals: (1) to provide students who have adequate training in the health sciences with the additional background to promote careers in research or service in developing countries; and (2) to introduce students to the significance, recognition and prevention of the major infectious disease problems of developing countries.

**Curriculum**

Students are required to fulfill the distribution requirements for an M.P.H. program (see page 17) and to take designated specialized courses offered by the Department; the nature of this specialized course work will depend on the interest of the candidate.

**Admission**

The one-year M.P.H. degree program is designed for persons with prior medical degrees (M.D., D.V.M., D.M.D., D.D.S.) or doctoral degrees in biomedical science who are interested in problems of infectious disease in developing countries.

**Career Outlook**

Graduates customarily direct programs dealing with the control of tropical diseases or with research on these entities. Posts are in the public or private sector and at the national and international level.

### Medical and Public Health Parasitology

**Goals**

The goals of the program are: (1) to acquaint the student with recent advances in the area of parasitic diseases and with the present status of such diseases throughout the world; (2) to develop skills for evaluation of the current literature and of control programs; and (3) to provide adequate background for conducting research on these diseases, including their molecular biologic and immunologic aspects. The Master of Science program is regarded as preparation for doctoral study.

**Curriculum**

All students must satisfy basic course requirements in biostatistics, epidemiology and tropical public health. Students usually take advanced course work in one or more of those disciplines, and also elect courses in health services, health policy and management, microbiology, population sciences, etc., according to their interests. Students commonly cross-register for courses in the Harvard Medical School (e.g., immunology, pathology) and the Harvard Graduate School of Arts and Sciences. Appropriate courses also may be taken at M.I.T. Some of the elective work within the Department of Tropical Public Health may take the form of tutorials, laboratory research projects or both. (See page 23 for specific degree requirements.)

**Admission**

Students with prior M.D. degrees or doctoral or master's degrees in biological or medical sciences are eligible for admission to this program. The exceptional candidate with a strong biological background but lacking a master's degree will be considered. For the student without prior preparation in pathology, biochemistry and immunology, two years of course work are customarily required before the S.M. degree is awarded;

students with sufficient prior preparation may earn the master's degree in one year. The majority of students go on to earn the S.D. degree and enter careers in research and teaching in the area of medical parasitology.

**Career Outlook** Graduates are prepared to pursue academic or administrative careers that deal with the important parasitic diseases of man.

**Ecology and Control of Vectors of Disease**

**Goals** The specific educational goals of the program are: (1) to acquaint the student with the various arthropod and molluscan vectors of disease and to develop an appreciation of the biology of these organisms and the means for their control; (2) to prepare the student to plan and evaluate control programs; and (3) to develop skills with respect to identification, maintenance and experimental procedures involving these organisms.

**Curriculum** In addition to required courses in epidemiology and biostatistics, participants in the program will take courses in vector biology, entomology, malacology, parasitology, and microbiology. Depending upon the particular interests of each student, courses in cell biology, invertebrate physiology, pathology, genetics, population ecology, and computer sciences may be required. Each participant will conduct a program of original research. (See page 23 for specific degree requirements.)

**Admission** Students admitted to this program normally have prior medical degrees or doctorates or master's degrees in biological or medical sciences. Most students take two years to earn the S.M. degree, although some students with previous education in relevant areas may earn the degree in one year. Almost all recipients of the master's degree continue on for the doctorate, in preparation for careers in teaching and research.

**Career Outlook** The primary goal of this program is to train vector biologists for careers in teaching and research in universities and in governmental and international agencies. Graduates are expected to occupy key positions in programs directed toward investigating and controlling vector-borne disease. International health is emphasized. Thus, graduates of the program may engage in basic biological studies and in operational research.

*Some of the courses the Department offers are described on page 163.*

*Facing page, Dr. Dade Moeller, Associate Dean of Engineering in Environmental Health and Director of the Office of Continuing Education.*

# *Centers and Offices*

## Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health, as a University-wide center to join scholars and scientists in different fields in a common approach to human population problems. The members and research associates of the Center are drawn from the Departments of Biology, Economics, Government, and Sociology; the Division of Applied Sciences; and the Schools of Public Health, Design, Divinity, Education, Government, and Medicine. The Center is located at 9 Bow Street, Cambridge.

In the School of Public Health, the Department of Population Sciences welcomes qualified candidates for the various degrees offered by the School. Courses open to all qualified students are also given by members of the Center in other parts of the University.

The present research programs of the Center and the Department focus on several themes: migration and development; laboratory and clinical research programs in human reproductive biology; economic, social, and environmental determinants and consequences of population change in America and other developed and developing countries, including public health aspects of fertility and the balance between populations and their resources; problems of urbanization and internal migration in both developed and developing countries; theories of population dynamics and their implications for public policy; political and ethical aspects of population policy; and the effect of nutrition and exercise on female reproduction.

The Director of the Center is David E. Bell, A.M., LL.D.

## Center for the Prevention of Infectious Diseases

The Center for the Prevention of Infectious Diseases comprises the Departments of Tropical Public Health and Cancer Biology. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents that parasitize man, and with their relevant arthropod and molluscan vectors.

On a global basis, infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of health. An increasing number of chronic degenerative diseases is recognized as stemming from the insults of prior infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The Faculty of the Center for the Prevention of Infectious Diseases works together to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases, as well as an introduction to specialized subject areas. For qualified advanced students, concentration in specific areas with participation in collaborative or individual research is encouraged at both predoctoral and postdoctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field.

The Director of the Center is John R. David, M.D.

## Institute for Health Research

Efforts to promote equity of access or to improve the quality of health care have often had unexpected, and occasionally adverse, effects on the economy, legal institutions and even on the effectiveness and efficiency of medical care itself. These complex and poorly understood ramifications of choices in the field of health suggest that decisions ought no longer to be considered the province of any single discipline, and that the study of many problems ought not to be left to the chance association of appropriate experts.

The Institute for Health Research was formed by the joining together, in July of 1983, of the Center for the Analysis of Health Practices of the School of Public Health and the Research Department of the Harvard Community Health Plan. The Institute's research agenda combines those of the antecedent organizations and includes interdisciplinary studies of: measures of efficacy, quality and cost-effectiveness of components of health care; factors influencing the decisions of providers and patients; resource flows in the health care system; and health policy.

The research output of the Institute appears in books, monographs, serial publications, and discussion papers.

Members of the Institute include some 30 investigators drawn from the Schools of Public Health and Medicine, whose disciplines include the medical specialties, psychology, biostatistics, economics, policy analysis, and engineering. While the Institute itself has no teaching responsibilities, its members maintain active departmental affiliations and teach in departmental programs. Appointment to membership in the Institute is the responsibility of its Executive Committee and is renewable annually. It is based on the individual's interest in, and willingness to collaborate actively in, the Institute's research activities, as well as on the relevance of the individual's professional skills to the Institute's research agenda.

The Institute receives its financial support from sources outside the University. The majority of its budget derives from research grants and contracts from governmental sources and private foundations. An important minority of its support comes as unrestricted funds from premium income of the Harvard Community Health Plan (HCHP) through the HCHP Foundation.

The Institute offers a variety of means for students to participate in its activities. Students whose dissertations concern issues in the health sector may wish to use the Institute as a resource during the development of their theses. Alternatively, a limited number of students may find opportunities to participate in Institute-sponsored research projects during the period of their enrollment in the University.

Students and faculty members who do not have a formal relationship to the Institute may remain aware of the research activities of its members by attending the weekly "brown bag" workshops, which serve as the major vehicle for communication among the members of the Institute and their collaborators.

Inquiries about the Institute should be directed to Drs. Howard Frazier, Donald Berwick, or Peter Braun, members of the Department of Health Policy and Management.

## The Kresge Center for Environmental Health

This Center serves as a focal point for environmental health-related research and training activities within the School of Public Health. It includes programs within several departments such as Cancer Biology, Environmental Science and Physiology, and Epidemiology. Full-time faculty within the Center are physicians, engineers, physiologists, mathematicians, toxicologists, chemists, physicists, and other professionals. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

Specific categories in which the Center conducts research and training include:

1. Occupational health and safety
2. Air pollution health effects and control
3. Biochemical toxicology
4. Radiation biology
5. Radiological health (radiation protection)
6. Respiratory biology (inhalation toxicology)
7. Environmental health engineering
8. Environmental health management

Degree programs include the Master of Public Health, Master of Science, Master of Occupational Health, Doctor of Science, and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the *Register*. Students interested in any of the

above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in the Division of Applied Sciences of the Graduate School of Arts and Sciences.

The Director of the Kresge Center is John B. Little, M.D.

## Educational Resource Center for Occupational Safety & Health

The primary objective of the Educational Resource Center is to train professionals who will be involved in preventing occupational disease and injury. Employment opportunities exist in universities, governmental agencies, industry, and labor unions. Full-time academic programs are offered at the master's and doctoral levels. The multi-disciplinary training is supported by a grant from the National Institute of Occupational Safety and Health. Financial support is available to qualified individuals on a competitive basis. College-level inorganic and organic chemistry are required for entrance unless specific exception is made. Applicants presently holding positions in the fields of occupational safety and health who plan to return to those positions are considered particularly strong candidates for admission. For further information about any aspects of the educational programs listed below, contact Professor Richard R. Monson, Department of Environmental Science and Physiology, 665 Huntington Avenue, Boston, MA 02115. Formal requirements for the degrees are on pages 16-25.

*Occupational Medicine*

The one-year master's program in occupational medicine is comprised of training in the public health disciplines relevant to the prevention and control of occupational disease and injury. The course work includes sessions in epidemiology, biostatistics, occupational medicine, toxicology, industrial hygiene, and health policy and leads to conferring of the Master of Occupational Health or Master of Public Health degree.

The two-year residency in occupational medicine is open to candidates who have completed one year of clinical training; in addition, certification by the American Board of Internal Medicine is recommended. The program includes the didactic year mentioned above, a practicum year during which skills are applied to problem solving and a short-term research project is designed and executed. Field experience is comprised of rotations through hospital-based occupational health clinics, the Massachusetts Division of Occupational Hygiene, and corporate medical departments. A certificate is awarded upon successful completion of the practicum year of the residency. Applicants should submit a letter indicating their desire to enroll in the residency program along with their application to the degree program.

*Industrial Hygiene and Occupational Safety*

The two-year master's program in industrial hygiene and occupational safety is designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control

health problems that exist in the workplace. The core curriculum includes recommended and required courses dealing with basic problems in occupational health and industrial environments, environmental control, safety science, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, biomechanics and work physiology, and aerosol technology.

Students specializing in industrial hygiene normally undertake internships and research projects dealing with toxic substances, noise, radiation, and heat stress. Those specializing in occupational safety normally undertake internships and projects dealing with physical hazards or work methods that cause traumatic or cumulative injury. Students graduating with an emphasis in either area will obtain the skills required to handle the broad range of environmental hazards which exist in the workplace.

Candidates for the programs normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with master's degrees in the above disciplines or prior training or experience in related areas may be able to earn the Master of Science degree in one year.

*Occupational Safety and Health*

Individuals with a baccalaureate degree and with advanced training in social or natural sciences may gain admission to a Master of Science degree program in occupational safety and health. The program can emphasize either the epidemiologic or policy aspects of occupational safety and health. This is generally a two-year degree program, although an individual with a Ph.D. or J.D. degree may complete the program in one year.

*Occupational Health Nursing*

A two-year educational program for the preparation of graduate nursing students in occupational health and occupational health nursing at the master's level is offered in collaboration with the Boston University School of Nursing. One academic year is spent at Harvard and one calendar year at Boston University. The program places major emphasis on promoting worker health and preventing disease through the development of occupational health assessment, intervention and evaluation skills. The training includes courses in occupational health, industrial hygiene, epidemiology, biostatistics, toxicology, occupational health nursing, health behavior, administration, and policy.

Applicants must have at least a baccalaureate degree in nursing from a National League for Nursing accredited program and three years of nursing experience. Upon completion of degree requirements, a Master of Science in Occupational Health Nursing degree will be awarded by Boston University and a Master of Science in Physiology (Occupational Health) degree will be granted by Harvard University.

## Office of Continuing Education

The Office of Continuing Education was established by the School of Public Health in January 1982. This Office is an outgrowth of the Executive Programs in Health Policy and Management and the Program of Continuing Education in Environmental Health. The purposes of the Office are: to stimulate continuing education activities throughout the School; to provide leadership in planning new programs; and to develop innovative approaches in this field. During the academic year 1985-86, the Office of Continuing Education will coordinate the presentation of approximately 30 courses, ranging from three days to two weeks in length, with the majority covering three to five days. Subject categories covered include Medical Sciences and Management, Occupational Health, Nuclear Safety and Radiation Protection, Environmental Management, and the Control of Indoor Environments.

Lectures in the courses are presented by regular faculty members of the School, supplemented by outside experts for the coverage of special topics. Selected courses incorporate the case method, while others include laboratory sessions during which participants can obtain practice in the use of the latest analytical apparatus and portable field measuring instruments. Each course offered under this program qualifies for one (1) Continuing Education Unit for every ten (10) hours of classroom participation. In addition, as an institution accredited by the Accreditation Council for Continuing Medical Education, the Harvard School of Public Health designates that certain courses meet the criteria for credit toward Category 1 of the Physician's Recognition Award of the American Medical Association. Selected courses have also been additionally reviewed and approved by appropriate environmental health-related certification boards.

Participants in the courses include physicians, health care personnel, scientists, and engineers. Most of the participants are employed by federal, state and local public health and regulatory agencies, industrial organizations, professional, trade and public interest organizations, legislative committees, research and development laboratories, public utilities, and consultant groups. During the 1984-85 academic year, over 900 professional personnel attended courses presented under this program. A partial listing of courses scheduled for presentation during the 1985-86 academic year is shown on page 121. Additional information can be obtained from the Office of Continuing Education, Harvard School of Public Health (Telephone: 617-732-1171). The Associate Dean for Continuing Education is Dade W. Moeller, Ph.D.

## Office of Health Policy Information

The Office of Health Policy Information is a resource center for journalists, government officials and others, and is designed to facilitate access to the University's wide-ranging resources in health policy analysis and research. It provides a mechanism for synthesizing and communicating available information in a manner that is timely and relevant to the needs of journalists, legislators, academic, corporate and labor leaders, and others involved in the consideration of health policy matters. The chief aim of the Office is to make a true public resource of the wealth of experience and information available within the University.

Current activities include the publication of a series of background reports analyzing health policy issues, a program of Ivan F. Boesky Visiting Fellowships for journalists and a monthly colloquium series, the Health Policy Forum. The reports are designed to keep key individuals abreast of important developments in health policy research and analysis. The fellowships provide distinguished medical and science reporters with the opportunity to spend six weeks in residence at the School while conducting intensive research. The Forum provides an opportunity for legislators, agency heads, health care providers, and corporate and labor leaders to discuss their views on health and science policy issues with an audience drawn from this state's academic, legal, political, consumer, health professional, and corporate and labor communities.

The Assistant Dean for Public and Community Affairs is Jay A. Winsten, Ph.D.

## Office of International Health Programs

The Office of International Health Programs provides advice to both foreign and American students with interests in international health in the selection of appropriate programs and courses, and coordinates activities within the School that are relevant to international health. The School provides opportunities for preparation for teaching, research and service in international health, with particular emphasis on problems of health in developing countries. The School does not offer degrees in international health per se, but in the various public health disciplines, adapted to meet the needs of international health students. The central methodologies taught in the School—biostatistics, epidemiology, policy analysis, demographic analysis, management skills, and so on—are logically applicable to health problems in any human population. Teaching them to students from widely varying backgrounds, however, and teaching their application to countries with very different geographic, cultural and historical circumstances, has required many modifications in curriculum and in course content. Case studies and illustrative materials from less-developed countries, for example, are included in readings and class discussions in a number of courses. And

some special courses are offered that focus primarily on less-developed countries, including courses on parasitic and infectious diseases, on nutrition and maternal and child health in developing countries, and on health services, health planning and program implementation in developing countries.

The process of adapting the curriculum to the needs of students interested in international health is an ongoing one, and at any time there are inevitably some specialized demands that the School cannot meet. It is important, therefore, that students interested in international health consult with the Office of International Health Programs to be sure they are aware of all the alternatives available and plan the use of their time at Harvard to maximum advantage. In addition to the courses regularly available in the School, special tutorials can sometimes be arranged where the interests of students and faculty members coincide. Moreover, there are relevant courses available in other parts of Harvard University. Appropriate courses also may be taken at MIT. Cross-registration opportunities are available for students interested in medicine, economics, public administration, education, anthropology, government, social relations, and related subject areas appropriate to particular regions of the world. (Students may also cross-register for courses in foreign languages, but may not apply credit for such courses toward degrees being earned at the School.)

Faculty members active in international health programs have had experience in countries in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and schools throughout the University, giving international health an interdepartmental and interdisciplinary orientation. Students at the School of Public Health come from more than 40 different countries.

The Director is Richard A. Cash, M.D., M.P.H.

*Facing page (left to right), Takemi Fellows, 1984-85, Lukas Hendrata, Keiji Tanaka, Prakash Chandra Gupta, Hong-Chang Yuan, and Ha-Cheong Yeon.*

# *Doctoral, Postdoctoral and Special Programs*

## The Graduate Program in the Division of Biological Sciences in Public Health

### The Division

In addition to the departmental doctoral programs, the School also offers a School-wide doctoral program in the biological sciences.

The goal of the Division of Biological Sciences in Public Health is to strengthen the application of biological knowledge and methodology to major issues of public health. As the first step, the Division seeks to attract able students for graduate study in the biological and biomedical sciences in order to bring to public health the most advanced ideas and techniques of the disciplines in which they have been trained.

The Division includes faculty members with research and teaching interests in the biological sciences from the Departments of Cancer Biology, Epidemiology, Environmental Science and Physiology (especially its Programs in Respiratory Biology and Occupational Health), Nutrition, Population Sciences, and Tropical Public Health, as well as the Laboratory of Toxicology.

### The Graduate Program

The graduate program is designed to provide training for students who have not yet selected an area of concentration among the public health oriented biological sciences. After entering the School, students in the Division will take courses for one or two years in order to gain a thorough grounding in the biological sciences as well as elements of the biomedical sciences and epidemiology. Students will also rotate for four- to eight-week periods through various laboratories and participate in Division-sponsored seminars. This will prepare them to make an informed choice of topic and academic adviser before embarking on doctoral thesis research.

### Admissions

#### General

Applicants to the Division should be committed to a career in the biological sciences related to public health, but need not have selected a specific area of research. Students in the Division will be supported financially. Admission will be to the Division as a whole as a candidate for a Doctor of Science degree. Applicants who have already chosen their field of study in a specific department may apply directly to their respective departments.

#### Requirements

Generally, applicants should have a bachelor's degree and demonstrated competence in organic chemistry, biological chemistry, general biology, general physics, and calculus. Applicants deficient in an area may be admitted provisionally, provided appropriate courses are taken before and/or after entry. The Graduate Record Examination (Verbal and Quantitative) is required.

Three letters of evaluation are required from instructors of science and mathematics. Evaluation letters from employers, for applicants who have worked in relevant areas, should also be supplied. Applicants desiring to visit the School are encouraged to come for an interview.

Additional information may be obtained from:

Chairman, Division of Biological Sciences
Harvard School of Public Health
677 Huntington Avenue
Boston, MA 02115

**Financial Aid**

The Division will provide eligible students with two years of financial support (full tuition plus stipend). Thereafter, support will be assumed by the sponsoring department or laboratory in which the thesis work is conducted.

**Graduate Instruction and the Curriculum**

Entering students will be assigned to a Division faculty member who will serve as an adviser and who will assist the student in planning a course program.

The curriculum during the first two years is intended to provide the student with a strong background in the biological sciences as well as a familiarity with the areas of public health to which this knowledge may be applied. During this period students will be expected to obtain sufficient laboratory experience so that they can select a specific research project for a thesis topic that will ordinarily require three years to complete.

Course requirements, which will ordinarily be met within the first year and a half, are intended to be flexible so that students with diverse backgrounds and different emerging career goals may be accommodated. Thus, students, with the help of their advisers, will select a coherent program that might include courses in such disciplines as biochemistry, cell biology, pharmacology, virology, immunology, genetics, pathology, and human physiology.

The unique orientation of the program is expressed in three required courses:

1. A course in biostatistics, which, assuming some knowledge of probability and scientific inference, will provide competence in the major statistical methods required for both laboratory and epidemiological research.
2. A course that presents epidemiologic methods and a systematic analysis of the health status of populations both within the United States and in other parts of the world.
3. An interdisciplinary seminar which covers the evidence and the methods used to elucidate the biological basis for the amelioration of such health problems as arteriosclerosis, cancer, the effects of chemical and biological toxins, and infectious diseases.

## Program in Human Ecology

The study of human ecology in a public health context is intended to integrate social, historical and ecological aspects of human existence in order to understand and influence the improvement of health in populations and communities. The Program emphasizes the inseparability of biological and social components of the patterns of health and disease, agriculture, environmental protection, and resource use within a framework of complex systems analysis.

Human Ecology is a new inter-departmental research and teaching program including faculty from the Department of Population Sciences and other areas. Students must be enrolled for a doctorate in one of the departments of HSPH and meet their department's requirements for the degree. In addition, they will usually take further training in quantitative and qualitative mathematical approaches to complex systems, general and human ecology, and demography. Advanced courses are available as electives relevant to the student's own research interests. These might include agricultural systems and production, population ecology, ecological anthropology, specialized courses in tropical public health, environmental sciences, and biology.

Students interested in doctoral work in human ecology should apply for admission to one of the academic departments of the School indicating that interest and also write directly to Professor Richard Levins, Department of Population Sciences.

# *Post-doctoral Programs*

## Interdisciplinary Programs in Health

The primary objectives of Interdisciplinary Programs in Health (IPH) are to enlist scholars from the natural and social sciences in finding new ways to deal with the critical health problems of today's society and to attract and train for health fields young and midcareer people with strong backgrounds in a natural or social science.

IPH is designed to bring to health problems the knowledge, skills, insights, and analytic techniques of a variety of disciplines. It is a University-wide program, based at the School of Public Health. Members of the Faculties of Arts and Sciences, Business, Government, Law, and Medicine participate in IPH.

IPH presently focuses on environmental health, with particular emphasis on issues of both science and public policy related to chemicals in the environment.

Over 40,000 chemicals are currently in production and more than 500 additional ones are introduced each year, many of them biologically active. The problems raised by these chemicals provide the principal emphasis of IPH. The studies range from laboratory studies of biochemical effects at the cellular level to risk assessments and policy analyses of the regulatory process. Individual programs reflect the interests and wishes of participants.

Participants leave IPH prepared to work on health problems in federal, state and local governments, in industry and in research and, in some instances, to launch programs at other universities.

It is not a degree-granting program.

**The Participants**

IPH provides opportunities for:

1. Promising graduates of advanced degree programs in the natural or social sciences seeking preparation for careers in which their talents can be applied to environmental health-related problems, either through fundamental or applied research or through service.
2. Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to environmental health-related problems.
3. Individuals from government or industry who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

In addition, IPH seeks to create new cooperative links among scholars within Harvard University as they work on problems relating their fields to applied health research.

The program has several components. First, research may be done individually, in collaboration with existing research groups or with new interdisciplinary teams. Second, seminars and working groups explore particular problems and develop papers and monographs. Third, Fellows and Visitors meet together regularly, joined by members of the Harvard faculty and distinguished guests, to exchange experiences and to discuss important issues related to health.

**IPH Fellows**

Postdoctoral fellowships are awarded for terms of one or two years, as appropriate, and may be renewable for a third year.

Fellows are chosen from the natural sciences (chemistry, biology, biochemistry, physics, and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.) and the social sciences (economics, sociology, public policy, law, management, etc.).

Those selected will devote their initial period to orientation, exploration of opportunities and selection of projects and advisers. Experimental facilities will be made available in the laboratories of existing research groups. It is expected that during the term of a fellowship a substantial investigation or analysis will be completed.

For further information on admission requirements, contact:
Dr. Donald F. Hornig, Director.

**Visiting Scientists and Scholars**

Visitors may be on leave from universities, industry or public interest organizations. If stipends are required from IPH, they will be adjusted to individual circumstances and the availability of other support to the applicant. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH, and a statement of the relation of IPH to their career objectives.

## The Takemi Program in International Health

The Takemi Program in International Health at the Harvard School of Public Health offers a limited number of fellowships for research and advanced training on critical issues of international health, especially those related to developing countries. This interdisciplinary program, which was established in July 1983, focuses primarily on mobilizing, allocating and managing scarce resources to improve health, and on creating sound strategies for disease control and health promotion. To address these issues, it seeks to attract mid-career and young professionals from around the world with backgrounds in public health, medicine, economics, administration, biological science, and other fields. Through its fellowships for highly qualified individuals, the Takemi Program expects to contribute to institutional development and to improvement of national policy in the individual's home country as well as to the advancement of knowledge. The Program is named for Dr. Taro Takemi, the distinguished physician-scientist who served for more than 25 years as President of the Japan Medical Association.

The Takemi Program has four major objectives:

1. To create better methods for mobilizing and using health resources in both rich and poor countries.
2. To promote cooperative research and comparative analysis of health policies and programs in different countries.
3. To study transnational causes of ill health, such as population migration and disease transmission, and air and water pollution.
4. To bring together leading health professionals and scholars from many nations for research and training.

The primary goals of research under the Takemi Program are to investigate how resources are allocated and used for health purposes and to develop methods for making such choices more rational and equitable. Initially, the Program will focus its research on a few of the world's most urgent health needs, especially in the developing countries, and the most effective ways to meet them. A number of areas of research will be explored, including:

1. The assessment, choice and application of health technology.
2. The structure, organization and financing of health care.
3. The relationships among rapid population growth, increasing pressures on the environment and health status.

In all areas of research, the Program emphasizes the social and cultural factors that shape each country's efforts to improve health. The research activities of the Takemi Program are expected to have a strong practical emphasis. Fellows carry out their research projects at Harvard, using data they bring with them, but the projects are expected to be closely linked to action programs and to the Fellows' subsequent work after returning home. Program findings and results are disseminated widely and opportunities are sought to apply them in various settings.

Each Takemi Fellow is responsible for a specific research project and participates in the Program's weekly seminar. The Takemi seminar, the

Fellowship Program's teaching activity, examines the question of how to set priorities under conditions of limited resources and evolving technology. The Takemi Program also sponsors one open seminar a month on important issues in international health, to explore possible research themes for the Program and to educate Harvard students and faculty on the state of knowledge and research in international health.

The Takemi Program is not degree oriented, as course requirements would substantially reduce a Fellow's time for research and writing. Upon completion of the Program, Takemi Fellows receive a Certificate and a record of their accomplishments as participants. Takemi Fellowships are generally awarded for 10 months. However, this may be adjusted in special cases.

The first Dr. Taro Takemi Professor of International Health is Dr. Lincoln Chen, who will also become Director of the Takemi Program when he assumes his position full time in the summer of 1986. The Acting Director of the Program is David E. Bell, A.M., LL.D., and the Executive Director is Michael R. Reich, Ph.D.

## *Special Programs*

### The Community Health Improvement Program

The Community Health Improvement Program (CHIP) is a community service component of the Harvard School of Public Health which complements academic programs and courses at the institution. The objective of CHIP is to effect improvement in the health of communities by developing, implementing and evaluating innovative, community-based public health strategies in conjunction with community agencies.

Students accepted in the program receive 5 credits per term for a combination of community internships and participation in community health seminars. CHIP addresses four issue areas: 1) environmental and occupational health, 2) housing, 3) nutrition, and 4) primary care for low-income populations.

The service goals of CHIP are fulfilled by students and by CHIP staff who directly assist community agency personnel in problem-solving efforts aimed at improving the equity, efficiency and effectiveness of health service delivery, and improving the utility of policy-relevant information and evaluation techniques.

Finally, CHIP demonstration and research projects are guided by more general needs for new public health knowledge and understanding. These projects are developed by CHIP staff, faculty members associated with CHIP and by students.

J. Larry Brown, Ph.D., is the Executive Director and Principal Investigator.

## Migration and Development Program

**The Program**

The aims of this new program at Harvard are to study the theoretical and empirical relationships between migration and economic development, the causes and consequences of migration *and* the various processes associated with it, and to draw policy implications. Fundamental assumptions that have served as the underpinnings of research and public policy on migration and development for more than a decade will be reassessed. As the movement of people can be analyzed within the context of a continuum of moves, both internal migration and international migration will be studied with a special attempt made to build bridges across research on these two issues. Based on economics, the program will look for rewarding interdisciplinary extensions.

The program plans to award fellowships for doctoral dissertation research on issues related to migration and development. Doctoral candidates in any Harvard or MIT department who have successfully completed the necessary written examination and their course requirements can be considered. In particular, the program seeks to support students of high promise from Economics, Population Studies, Sociology, Political Economy and Government, Urban Planning, Regional Studies, Statistics, and Public Administration.

Students are selected by the program's director in consultation with the program's faculty advisory committee representing the fields of Economics, Sociology, Demography, and Political Science.

Fellowships are awarded for a two-year period.

Inquiries regarding applications for fellowships should be directed to:

Doctoral Fellowships
Migration and Development Program
Harvard University
9 Bow Street
Cambridge, Massachusetts 02138

## Public Health for Lawyers

With the dramatic expansion of legal and regulatory issues in health fields, the need for lawyers with formal training in the health sciences and disciplines is a critical one. There is a growing specialty field for lawyers in various applications of health law, including hospital and health care law, personal injury and compensation law, environmental health law, occupational health and safety law, child health law, etc. To meet the need, the School of Public Health has organized an interdisciplinary concentration in public health for legally trained students.

Various degree programs are open to applicants with a law degree and an aptitude for public health studies, as evidenced by undergraduate training which should have included courses in statistics, biology, psychology, health sciences, and other relevant areas. Most applicants will have been in law practice at least for a few years, preferably in health law areas. Some applicants are more recent law school graduates who show special promise for health law careers.

Lawyers may enter the General Program of the Master of Public Health degree program, or concentrate in particular departments of the School. For example, a special track of courses has been developed for lawyers in the Department of Health Policy and Management. Lawyers have also taken special concentration in Occupational Health, Environmental Health, Maternal and Child Health, and Population Sciences. Greater special concentration can be achieved by taking a Master of Science degree within a department or on a cross-departmental basis. To supplement their studies at the School, lawyer degree candidates may also avail themselves of course offerings at Harvard University's Schools of Law, Government and Medicine.

Inquiries may be addressed to Professor William J. Curran, 677 Huntington Avenue, Boston, MA 02115.

*Facing page, John Shefield, technical assistant in the Department of Cancer Biology, working on the FACS (Flourescent Activated Cell Sorting) Analyzer.*

# *General Information*

## History of the Harvard School of Public Health

Professional education in public health had been steadily expanding in Harvard University for more than two decades before the actual founding of the School in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In that year, a Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine, and in 1918, the Division of Industrial Hygiene with clinical and laboratory facilities were organized in the Harvard Medical School.

Also in 1913, the Harvard–Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

In the early years of the School's operation, several of its departments functioned as joint departments with counterparts in the Medical School, sharing facilities, faculty and budgets. In 1946, the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close associations with other divisions of the University, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government and the Graduate School of Business Administration.

The School provides graduate education to prepare people for careers in the practice of public health and for academic and research careers in the public health sciences, as well as mid-career education. It offers the degrees of Master and Doctor of Public Health, Master and Doctor of Science and Master of Occupational Health.

### Location and Resources

The main buildings of the School are the Health Sciences Laboratories at 665 Huntington Avenue, and the Sebastian S. Kresge Educational Facilities Building at 677 Huntington Avenue, Boston. These buildings are near the Harvard Medical and Dental Schools; the Countway Library of Medicine; the Children's Hospital Medical Center; the Beth Israel Hospital; the Brigham and Women's Hospital; and other Harvard-affiliated hospitals. The School's Center for Population Studies has an office in Cambridge.

**Health Sciences Computing Facility**

Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF). A staff of computer programmers and analysts assists researchers and students from all of the Harvard Medical Area institutions in using the computers as a tool for analyzing data, for doing extensive numerical calculations, for text formatting, and for acquiring, maintaining and processing large data bases.

HSCF is equipped with six computer systems, three of which are used interactively in a time-sharing mode, two of which can be used interactively or in a batch processing mode, and one which provides services to some of the other machines. Remote batch processing is accomplished by a high-speed telephone link to the ITEL AS/7031 computer at the Harvard Computing Center in Cambridge. Remote interactive computing is provided by telephone links to computers at the Dana-Farber Cancer Institute, the Harvard Computing Center, and the Massachusetts Institute of Technology.

HSCF offers computing capability for School programs using one VAX 11/750 and two VAX 11/780 computers running the UNIX operating system, a VAX 11/780 computer running the VMS operating system, and an IBM 4341 running the VM system which offers CMS (interactive) and OS/VS1 (batch). The IBM 4341 features a number of statistical packages including SAS, SPSS, and BMDP. Languages available at HSCF include BASIC, Fortran 77, PL/1, MUMPS, Pascal, and C. Additionally, fifty-five DEC Professional 350 and IBM XT/PC personal computers are distributed throughout the School. Students may access the HSCF computers through teleprinter and video terminals as well as through personal computers. A number of inexpensive terminals, together with modems, are available for student rental.

HSCF also maintains a tape library of data from the National Center for Health Statistics. Documentation and tapes are available for reference and copying.

HSCF staff participate in several computing courses given by the Department of Biostatistics. In addition, HSCF offers short courses on specific languages, packages and specialized medical and health data bases. Students who have had computing experience may enroll in special tutorials (BIO 313a,b,c,d). The Director of HSCF is Dr. Marcello Pagano.

**Libraries**

The library needs of the School are served principally by the Francis A. Countway Library of Medicine, located at 10 Shattuck Street. The Countway Library combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country, with recorded holdings of more than 509,000 volumes and 4,500 periodicals. The Countway Library also has extensive collections of historical materials, dating from the fifteenth century. Its History of Medicine Department provides modern facilities for the use of these books and other rarities.

All members of the University may borrow from the Harvard College library at Cambridge. Messenger service is provided daily between the college library, various other Harvard University libraries and the Countway Library. Some departments within the School also maintain their own libraries. The Boston Public Library, libraries of the Massachusetts Institute of Technology and other libraries of the Boston area add to the total book and periodical resources available to students.

**Other Resources**

Students at the School may enroll in courses in other faculties and departments of Harvard University, e.g., in the natural sciences, public administration, economics and other social sciences, statistics, and medical sciences. Many graduate courses at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the School. Students will generally be granted credit for such courses toward degrees being earned at the School of Public Health, with the exception of courses in foreign languages. Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree in question.

The School maintains a close association with a wide variety of health, medical care and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and certain other institutions adjacent to the School are available to qualified students. Other local, national and international health facilities provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health offers opportunities for qualified students to obtain experience in laboratory methods pertinent to public health.

*Taking a tour of Countway Library.*

## Application for Admission

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1030). Applications for admission are generally accepted only for the fall term because of the sequencing of courses.

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) a completed application form which includes application fee, application file card and mailing labels; (2) transcripts of academic records at college, graduate schools and/or professional schools, with official certification of degrees conferred; and (3) letters of recommendation from at least three people who are well acquainted with the applicant's previous academic work and experience. In addition, the Graduate Record Examination must be taken within the last five years by certain applicants, as noted in the *Degree* section at the beginning of this *Register*. Applicants are advised to take the Graduate Record Examination no later than the December test administration date. Applicants may apply to one degree program and one specialty area only. Please note that the applicant is responsible for assuring that the transcripts, letters of recommendation and testing scores and/or TOEFL scores, if applicable, are submitted. Any materials submitted become the property of the Harvard School of Public Health.

An application fee of $40, which is not refundable, must accompany the application in the form of a check drawn on a bank in the United States, a postal money order, or an international money order payable to the Harvard School of Public Health.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee on Admissions and Degrees as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee.

Admitted applicants submit a $100 tuition deposit when confirming admission. This deposit is credited to the fall term bill and is not refunded if the student fails to register.

The School is unable to accept all who are eligible for admission. Therefore, persons who wish to be considered for admission are urged to submit their completed applications (with all supporting documents) by February 1 prior to the academic year in which they wish to enroll. Completed applications received between February 1 and March 1 will be placed in a late applicant pool.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, re-application is necessary and will be considered on the same competitive basis as a new application. Exceptions to this must be approved by the Committee on Admissions and Degrees.

Harvard University's policy is to make decisions concerning applicants, students, faculty and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable anti-discrimination laws. Increasing numbers of students with disabilities are enrolling at Harvard and are participating in a wide range of programs and activities. Every effort will be made to meet special needs. There are, however, no separate academic programs for either the physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. The Director of Student Affairs has been designated to assist handicapped students and employees in adapting to life at the School.

**Foreign Students**

*Language Proficiency*

Applicants from countries in which the language of instruction is not English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language competently. Only students who have shown evidence of academic excellence and who can understand rapid, idiomatic English and can speak, write and read English with a high degree of facility should apply for admission. Students should be advised that they may be required to attend 10 or more classes each week and to write papers and frequent short examinations. The School requires that all students maintain a minimum grade average of B− (grade point average 2.70) for graduation, and some departments and programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before admission. If a student completes all required course work but does not have a grade point average (GPA) of 2.70, the student will not be permitted to receive a degree.

The School requires that foreign applicants obtain a satisfactory score (ordinarily 550 or better) on the Test of English as a Foreign Language (TOEFL) and that the TOEFL scores be no more than two years old. The test is administered four times a year at centers throughout the world. Applicants are advised to take the TOEFL no later than the January test administration date. Information concerning the test may be obtained by writing to the Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08540. *Applications will not be considered without documentation of English proficiency satisfactory to the School.*

*Financial Certification*

The School has adopted the following policy regarding foreign nationals who are applying for admission from outside the United States. An applicant whose financial support is not guaranteed by an official U.S. agency or foundation must submit evidence satisfactory to the School

that he or she will have sufficient funds available in U.S. currency to pay the expenses for the full period of his or her academic program, and that he or she is permitted to exchange or export these funds. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the United States can be issued.

Foreign students who are wholly supported by personal funds, family funds or sponsor's funds which are given directly to them are required to have adequate funds to cover both the first semester's tuition, fees, and living expenses (in an escrow account in a bank in New York, NY or Boston, MA) and the second semeser of tuition, fees, and living expenses (in a bank account either in the U.S. or in the student's home country). An official letter stating the amount in U.S. dollars must be sent directly from the bank to the Admissions Office for each account before the immigration form can be issued.

Foreign nationals admitted to the School and already residing within the United States will also be required to submit satisfactory evidence of sufficient funds to cover their expenses for the full period of their academic program. Such students will not be permitted to register at the School unless they have adequate funds to cover the cost of tuition in an escrow account in a U.S. bank.

An estimate of living expenses in the Boston area may be found in the section entitled "Living Expenses" on page 108.

*Academic Credentials*

Before foreign students are permitted to register, the School must receive transcripts, bearing the institution's official seal, of all academic records presented for admission. These transcipts must be placed in a sealed envelope and signed across the seal by the proper authority. Photocopies of original transcripts or diplomas are accepted only if the applicant is unable to obtain official transcripts and degree certificates and only if properly notarized, placed in a sealed envelope and signed across the seal by a notary public. Any materials that are not received in a signed and sealed envelope are not considered official. If an institution refuses to provide the applicant with an official transcript in a sealed and signed envelope, the applicant should ask that institution to send the official transcript directly to the Admissions Office. This should be indicated on the application.

*Employment*

Foreign students admitted to study programs at the School of Public Health who hold M.D. degrees and who will be holding either an F-1 or J-1 visa under the sponsorship of Harvard University will not be permitted to accept any employment for which an M.D. degree is a prerequisite while in this country under the sponsorship of the University.

J-2 work permits are not automatically granted for spouses of students. Spouses should not expect to receive such a permit during the first six months or even a full year after they enter the country.

*Hospital Insurance*

All nonimmigrant foreign students are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan. There can be no exceptions to this requirement. More information about the plan is included in the section "Registration and Tuition."

All inquiries and communications regarding admission should be addressed to the Admissions Office at the address given on page 89.

## Requirements for Non-degree Status

**Courtesy Students**

Persons holding Harvard Corporation appointments (of at least half-time teaching faculty) are permitted to enroll in courses at the School with the permission of the instructor and the Registrar. Harvard employees should consult the Personnel Office about the provisions of the Harvard Tuition Assistance Plan. Courtesy students may take a maximum of 5 credits per term. In courses with restricted enrollment, preference is given to degree candidates. Payment is not refundable and must be made at the time of or prior to registration.

**Courtesy-Special Students**

Persons holding Harvard Corporation appointments (but who are not half-time teaching faculty) and full-time employees of a Harvard affiliate (eligible for their employer's tuition assistance plan) may apply for courtesy-special student status. Applicants must hold at least a bachelor's degree. Admission as a courtesy-special student carries with it no commitment to accept the applicant as a degree candidate and is limited to no more than five credit units per semester and ten credit units in total. Courtesy-special students are not admitted to audit courses, and their admission is subject to the availabilty of space and the permission of the instructor. Courtesy-special student status is governed by the same policies that apply to all matriculated students, except that payment is not refundable and must be made at the time of or prior to registration.

Courtesy-special student applications can be obtained only by coming in person to the Admissions Office.

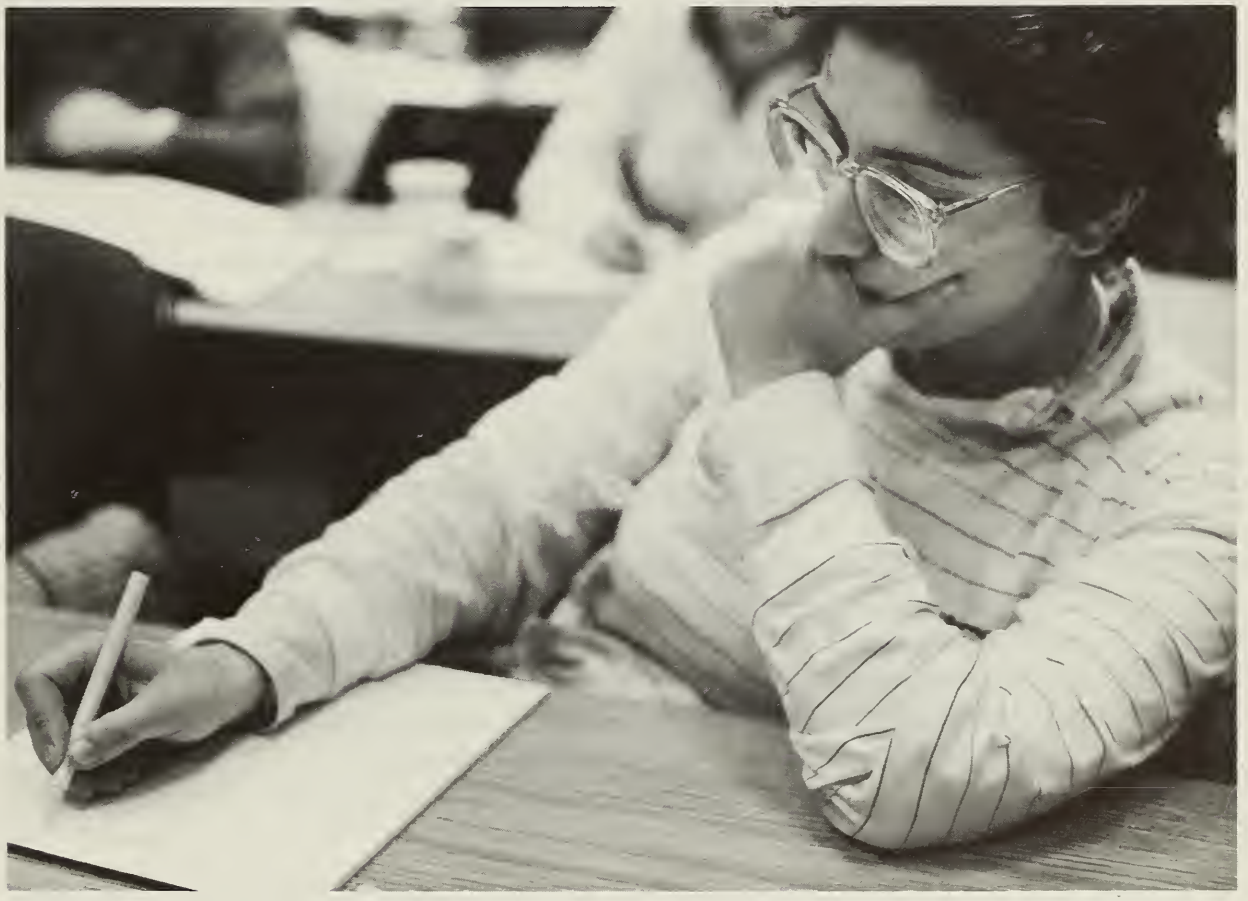
**Special Students**

The School may accept a few students who are not degree candidates. Procedures and requirements for the admission of such students are the same as for degree candidates. Admission of special students to courses is subject to availability of space and the permission of the instructor. Candidates should specify on the application form the courses they plan to take. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate and is limited to one academic year. Special students who wish to be admitted to degree candidacy must re-apply and will be considered on the same basis as other applicants for admission. Special students are not admitted only to audit courses. Special student status is governed by the same policies that apply to all matriculated students, but those enrolled less than full time are restricted to courses at HSPH. Students enrolled less than half

time are charged tuition on a per credit basis. Payment is not refundable and must be made at the time of or prior to registration. (See tuition and fees on page 103).

**Retroactive Credits**

Degree applicants who have previously taken courses at the School while in a nondegree status may, at the time of their application, petition to count up to 10 credits retroactively as part of the academic credit requirements. These courses must have been taken within three years of the date of entrance into the degree program and cannot be or have been counted toward any other degree at this School or at any other school. Applicants who were cross-registered at the School of Public Health while enrolled at another Harvard affiliated school must include with their petition an official transcipt from the other school as well as a letter from that school's Registrar stating that the courses taken at the School of Public Health have not been counted toward a degree. A request for retroactive degree credit must be approved by the department or program with which the student is affiliated and by the appropriate subcommittee of the Committee on Admissions and Degrees. Permission may be granted if the courses fit into the applicant's academic program. Tuition credit will not be given for previous course work, and students are expected to meet full tuition requirements for the degree. (See page 105 for tuition guidelines.)



## General Information

### The Academic Year

The academic year is divided into two terms. In the School of Public Health, the fall term begins in mid-September and the spring term begins in late January. Each term is divided into two periods: "a" and "b" in the fall term, and "c" and "d" in the spring term. Between the terms, in January, a week of field work and special projects is called "e" period. There is a similar period during March recess called "f" period. The *Academic Calendar*, which gives term dates, recess periods, holidays, etc., is printed in the front of this *Register*.

### Official Notices

It is important that each student keep informed of all official notices which are posted on the Office of the Registrar bulletin boards located on the G-Level of the Kresge Building.

### Degree Candidates

Credit units are assigned on the basis of the total amount of time required by a course, both class time and outside preparation.

*Full Time*

Twenty credit units constitute a full program for one term, and a student must take a minimum of 40 credits for the year to be registered as full time. A full-time student must take a minimum of 15 credits per term and a minimum of 5 credits per period.

A full-time student may register for a maximum of 25 credit units per term unless permission to take more than this amount is obtained from the Committee on Admissions and Degrees (CAD). Any student seeking this permission must submit a CAD petition to the Registrar when s/he files a course form. Full-time students will not be charged additional tuition for any credits over 40 per year.

Students in the two-year, 80-credit Master of Science program must take a minimum of 40 credits in the first year and a minimum of 35 credits in the second year. Students who take additional credits in the first year may carry over only *five* (5) credits into the second year, i.e., the total 80-credit requirement may be met by taking 45 credits the first year and 35 the second year.

*Half Time*

Ten credit units per term constitute a regular program for half-time students. Half-time students may register for a maximum of 12.5 and a minimum of 7.5 credit units per term for a total of 20 credits per year. Credit units over 25 per year will be assessed an additional tuition charge of $225 per credit unit. Tuition paid for credits over 25 per year may not be applied toward total tuition requirements. Students wishing to take more than 25 credits per year must petition the CAD for approval, in addition to paying tuition for the extra credit units. A one-year program may be completed in two academic years.

*Part Time*

Students may register as part-time degree candidates with the approval of the Committee on Admissions and Degrees. Ordinarily this requires at least half-time attendance; however, full-time, full-tuition requirements for the degree must be met (see tuition and registration guidelines, page 105). A two-year, 80-credit-unit program must be completed in three academic years. Tuition is charged at the full-time rate for the first year and at the half-time rate for the following two years. Part-time degree candidates ordinarily take a total of 80 credit units in three years. Students in a two-year program desiring any other credit hour/program arrangements must submit an application to the CAD for approval.

**Registration**

Fall registration is held during the week prior to the first day of classes. Registration dates and deadlines for fall and spring terms are listed in the *Academic Calendar* in the front of this *Register*. A fee of $25 per week will be charged for late registration.

All foreign students who are registering at the School of Public Health must report to the Harvard International Office, Holyoke Center, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of each academic year or the beginning of the spring term if not registered for the preceding fall term. There they must present their passports and entry permits or other evidence of their immigration status. This requirement applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa or permanent resident status.

Every student who is a degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or part time, must register in person at the beginning of each term. Doctoral candidates doing advanced work may petition the Committee on Admissions and Degrees to register with nonresident status. Since nonresident status is ordinarily considered less than half time, students in this category automatically fall into loan repayment and must make special arrangements for continuation of health insurance, as they are not eligible for the regular Harvard plans. Foreign students who wish to study as nonresidents but within the U.S. may petition for full-time status in order to maintain visa requirements. (See page 90 for additional information about nonresident status.)

To complete registration each student must file in person a study card (see *Academic Calendar*). Registration is not considered complete or official until the study card has been accepted by the Registrar's Office. Study cards may not be submitted by persons other than the individual student unless the student has obtained special permission from the Registrar. If students wish to take courses which are jointly offered at the School of Public Health and other Harvard faculties, they must register for these courses at the School of Public Health.

Courses may be dropped from the schedule at the discretion of the instructor if less than five students enroll.

**Petition to Change Courses**

All changes in courses, whether within the School of Public Health or by cross-registration, must be made by petition. Official forms for dropping or adding courses or changing a grading option are available in the Registrar's Office (see *Academic Calendar* for deadline dates). After the official deadline, any drops/adds/changes in grading option require that the student submit a formal petition to the Committee on Admissions and Degrees. A charge of $30 is assessed for the processing of any petition which is approved by the Committee.

Regarding changes in grading option, the Committee will ordinarily approve the petition if no grade has been received on a test or paper. However, if a grade has been received, a change in grading option ordinarily will not be approved.

**Cross-Registration**

Students may take courses in other faculties of Harvard University. Cross-registration at MIT and the Fletcher School of Law and Diplomacy is permissible if a course is appropriate to the student's program at the School of Public Health and no substantially similar course is available within Harvard University. Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree program of the student. Detailed instructions, credit conversions, and cross-registration petitions are available at the HSPH Registrar's Office.

Students cross-registering into other schools or faculties must meet the deadlines set by *both* the School of Public Health and the school or faculty offering the course. This is true for registering, adding or dropping a course, or changing a grading option, whether the course is being taken for credit or on an auditing basis. After the School of Public Health deadline, any adds/drops/changes in grading option require the submission of a CAD petition (see section on *Petition to Change Courses*). Students should check instruction sheets and the *Academic Calendar* for deadlines. (*Note*: Students should avoid visiting the Registrar's Office in another faculty on the day of that School's initial registration.)

Students are advised that dates of deadlines for cross-registration (C-R) and for beginning of classes vary from school to school (MIT, the Business School and the Law School begin fall classes at least one week earlier than the School of Public Health), sometimes making it difficult to coordinate registrations. It is important to consider the desirability of cross-registration in light of two factors. First, some schools pattern the length and activity of their classes much differently than the School of Public Health. At the Business School, for example, classes meet intensively for several hours at a time instead of meeting in several one- or two-hour sessions per week. This may interfere with a student's ability to attend classes at HSPH. Second, commuting time to all but the Medical School may be as long as 45 minutes each way in winter, so that a total commitment of three hours may be required merely to attend a one-hour class. A student should discuss desirability and feasibility of cross-registration with his/her adviser.

Grades for C-R courses are transferred from other faculties according to their grading systems and not those of HSPH. Individual instructors may not determine grading options for cross-registered students but must conform to their faculty's official regulations. Students who cross-register are bound by the rules and regulations of the respective faculties regarding grades, examination schedules, make-up examinations, and incomplete work. These regulations are often very different from those at HSPH, and students with questions should consult with the Registrar of the faculty involved. Degree candidates are urged to check the examination schedules of cross-registered courses to avoid possible problems of late reporting of grades to HSPH faculty for the degree lists. Some schools give examinations at so late a date that grade returns are not possible for HSPH degree candidates.

Undergraduate-level courses taken by cross-registration are not counted toward a degree at HSPH. Credit is not granted for undergraduate-level courses. Part-time special students at HSPH may not cross-register.

*Radcliffe Seminars and Harvard Extension School courses* do not receive degree credit at HSPH.

**Tutorials**

All tutorials receiving degree credit at HSPH must be taken under the supervision of an HSPH faculty member. Any student seeking exception to this ruling must petition the Committee on Admissions and Degrees for approval. Students must obtain permission from their advisers and file tutorial forms giving descriptions of the course content, hours required and credit to be awarded when they file course forms. Students are expected to complete a minimum of two hours of work per week throughout the term to receive one unit of credit. All tutorials are given on a pass/fail basis. Ordinal grading is not permitted for tutorials. Tutorials are normally limited to five students.

**Audited Courses**

Courses may be audited at the discretion of an instructor. No credit is given and no audited courses appear on permanent records or transcripts. Some HSPH courses exclude auditors; such courses are indicated on the Schedule of Courses.

**Withdrawal and Leave of Absence**

Students wishing to *withdraw* must notify the Registrar and their department in writing and schedule an exit interview with the Director of Financial Aid and the Harvard International Office where appropriate.

Students wishing to take a *leave of absence* must file a petition using a form available in the Registrar's Office which must be signed by the adviser and department chairman. The Committee on Admissions and Degrees ordinarily grants leaves of absence for a maximum of two terms.

Students planning to petition for a leave of absence or to withdraw should make an appointment with the Director of Student Affairs.

Tuition is prorated according to the calendar dates published on page 105. The effective date of a withdrawal will be the date the letter of withdrawal is filed with the Registrar, or a future date if so requested in the letter by the student. For students granted a leave of absence,

tuition is charged to the end of the tuition period in which the student is granted the leave of absence. The deadlines for leaves and withdrawals from the School without becoming liable for payment of tuition are given in the *Academic Calendar*. A student who fails to register by the last day to register in a term is automatically withdrawn unless a leave of absence has been approved. Students who withdraw must apply for re-admission. Students who withdraw after the last meeting of a class will be considered registered for the entire course and the grade will be recorded. Blue Cross-Blue Shield health payments may not be prorated but must be paid by the term.

**Notification of Grades**

Grade reports for the fall term are available in the Registrar's Office at the end of February. Spring grade reports are mailed to permanent addresses at the end of June. No grades are given to students either by telephone or in person. Students who wish to know their grades immediately after a course ends may leave a stamped, self-addressed postcard with their instructor or hand it in with the bluebook in courses giving final examinations. Students should confirm this arrangement with the instructor.

**Transcripts**

Official transcripts may be ordered by filling out a form in the Registrar's Office. The first copy is free; subsequent copies are $1 each. Students should allow five working days for processing transcript orders. Transcripts given directly to students are stamped "Issued to Student," and anyone requesting records should check to be sure other institutions accept transcripts sent by someone other than the Registrar.

If a student leaves the School with outstanding financial obligations to the University, transcripts are sent directly to the student and not to third parties. Such transcripts carry notations "Issued to Student" and "Student's Financial Obligations to the University Have Not Been Met."

Transcripts which students submitted to the School of Public Health as part of the admission process to the School remain part of the student's permanent record. These transcripts are never sent to third parties. Students must obtain copies of these transcripts from the school where the academic credit was earned and the degree awarded.

**Student Addresses**

All students must give their local address at registration and must keep the Registrar's Office informed of any changes in their local address.

**ID Cards**

Students are issued official Harvard University identification cards for use throughout the Harvard community to gain access to libraries and classroom buildings. Since these cards are often used as general identification for cashing checks, it is essential to take precautions against loss. Replacements may be ordered through application at the Registrar's Office, where temporary IDs are issued. A replacement fee of $10 is charged to a student's term bill. These cards must be returned to the Registrar's Office upon termination of student status.

**Summer Study**

HSPH has no regular summer course program, but some students elect to do tutorial or research work during the summer recess. A maximum of 5 credits will be given for degree credit in summer study. Students

must file summer registration forms with the Registrar's Office by May 23 in order to receive degree credit for summer work. Tuition for summer courses may not be applied toward tuition requirements for the degree.

**Harvard and MIT Summer Schools**

Students should consult departmental advisers before enrolling. Because departmental approval is required, signed petitions for degree credit must be filed with summer registration forms. However, the Committee on Admissions and Degrees considers petitions for degree credit only after final transcripts have been requested by the student and received by the HSPH Registrar's Office.

*All other summer work* must have prior approval of both the department and the CAD for consideration for degree credit. The deadline for such petitions is May 23. Degree credit is not ordinarily granted for work done at universities other than Harvard and MIT.

## The Grading System

The grading system is as follows: Courses on the 100 and 200 level may be taken with ordinal or pass/fail grades. The ordinal system used for 100- and 200-level courses is A,B,C, and F. The grades have the following numerical values: A = 4.0 (Excellent), A− = 3.7, B+ = 3.3 (Good), B = 3.0, B− = 2.70 (Satisfactory), C+ = 2.3, C = 2.0 (Poor), C− = 1.7, F = 0 (Failing). Courses at the 300 level may be taken only pass/fail.

Minimal grade point average requirements and distributional requirements have been instituted for all students entering degree programs in the fall semester of 1979 and thereafter. Semester and cumulative grade point averages are computed on courses taken on an A,B,C,F basis anywhere at Harvard and MIT. Courses taken pass/fail or on grading systems other than A,B,C,F are not calculated in the grade point average. The minimal standard for satisfactory work is 2.70. Note that grades below B− can be offset by grades above B−, but the final grade point average must reach 2.70 or above in order to qualify a student for a degree. Individual departments and programs may set more restrictive standards.

Students in a one-year degree program are required to take a minimum of 30 credits on the A,B,C,F basis and the remainder as the student elects. Students taking degree programs lasting two or more years are required to take a minimum of 60 credits on the A,B,C,F basis and the remainder as the student elects. This requirement will be verified by the Registrar prior to the awarding of any degree. Doctoral students must receive grades of either A or B in courses counted for their major or minor fields.

Exceptions to this policy can be sought by students or faculty by petition to the Committee on Admissions and Degrees. Cross-registered courses taken elsewhere at Harvard can be included in the minimums if they are at the 100 level or above and if taken with an A,B,C,F grading system.

Faculty are encouraged to offer both grading options (ordinal or pass/fail) in all 100- or 200-level courses. However, faculty who wish to offer only the ordinal grading system may do so but must publish this information in advance of the beginning of the course.

Courses may not be limited to pass/fail only, as students have the right to receive grades on the A, B, C, F (ordinal) system if they so designate at the time of course registration or subsequently by petition.

When courses are taken on a pass/fail basis, grades A through C− are equated with a Pass. A grade of F has the same value (0 credit) in either the ordinal or the pass/fail system. Grades received in courses taken on a pass/fail basis are not included when computing the student's grade point average.

Students may normally repeat failed courses for both grade and credit. The grade received when the course was taken the first time remains a permanent part of the record, but only the repeated grade will be used in computing the cumulative grade point average. (See section on *Failure of Required Courses*.)

A grade of incomplete (I) may be awarded at the discretion of the instructor. Incompletes remain a part of the student's permanent record. Once a grade is received, it is added next to the incomplete, e.g., I/B. An incomplete will be recorded as a failure on a student's permanent record unless the deficiency has been corrected by the end of the next term, on the deadline noted in the *Academic Calendar*. An instructor may require that the student correct the deficiency earlier, in which case the student and the Registrar should be informed in writing of the deadline. Students receiving an incomplete for a course required for graduation will not be awarded a degree until the course work is satisfactorily completed and a passing grade submitted to the Registrar's Office in writing.

**Failure of Required Courses**

BIO 200a,b or BIO 201a,b (or HPM 219b,c,d) and EPI 201a or EPI 221a are courses that are required for all Harvard School of Public Health students. Each department has specific requirements for students concentrating in that department. ESP 201a or ESP 201c and ESP 202b or ESP 203d, HPM 221a,b and a case studies course are required for all M.P.H. students. The CAD has voted the following procedures in the event of failure in one or more of these courses:

1. If a student fails two or more of these courses, no makeup arrangements will be permitted.
2. If a student fails one of these courses *and* is in the first year of a two-year program, the course should be retaken in its entirety. If a course is repeated in its entirety, the initial failure, although it remains on the student's record, will not be counted in the final grade point average.
3. If a student fails one of these courses *and* is in the last (or only) year of a program, a makeup tutorial is permitted at the discretion of the department chairman. The specifics of any makeup tutorial must be approved by the CAD each year. In general, the following procedures

apply:

a. A makeup tutorial should be graded pass/fail and will receive academic credit. The tutorial need not be for as many credits as the failed course; 2.5 credits is the recommended credit load for the tutorial.
b. The makeup tutorial should have a final examination.
c. At the successful completion of the makeup tutorial, the department chairman should certify to the CAD in writing that the student has met minimum departmental requirements for the subject matter of the failed course.
d. The makeup tutorial does not replace the original failure which remains on the permanent record and is included in the final grade point average.

**Final Examinations**

Final examinations are ordinarily scheduled during the last week of each period. Final examinations must be taken and may not be repeated, except that, with the concurrence of the Associate Dean for Students and the Chairman of the Department concerned, a faculty member responsible for a first-quarter fall course ("a" period) may offer a re-examination to students who have failed the regular final examination. A student who does not attend a final examination in a course will be given a grade of ABS. At the discretion of the Director of Student Affairs and the instructor, makeup examinations may be given to students who were absent from the regularly scheduled final exam because of significant medical or personal reasons. In such cases, the Director of Student Affairs and the instructor should be given notice in advance of the beginning of the examination. Unexcused absences remain ungraded, and no credit is given for the course. Incompletes may not be given for unexcused absences from final examinations. Incompletes should be given only in cases in which the student and the instructor have agreed in advance upon a plan to complete the course satisfactorily. An incomplete not completed by the end of the next term automatically becomes a failure.

**Grade Points**

Grade points for a course will be determined by multiplying the number of credit units times the value associated with the grade assigned. The grade point average is defined as the sum of grade points earned divided by the total credit units for which grade points were calculated. Pass/fail credits are *not* included in computing grade point averages.

**Grade Point Averages**

The minimum standard for satisfactory work at the School is a B− average or a grade point average of at least 2.70. In some departments and programs, however, students are expected to maintain an average above this minimum. Such requirements are stated by the department in advance. A student whose record is below the standards of the department may, at the end of a given term, be informed by the Committee on Admissions and Degrees, upon recommendation of the department, that he or she may re-register subject to specific academic conditions, which if not fulfilled by the date specified may result in the termination of degree candidacy.

**Alternatives**

During registration, each student should indicate on the study card which grading system—ordinal or pass/fail—is desired. Note that 300-level courses are graded only P/F. In the event of cross-registration, the grading system of the host school must be used for that particular course. Students planning future application to doctoral programs are advised to elect the ordinal system. Doctoral students must elect the ordinal system in all courses offered for their major or minor fields. Students should discuss the advantages and disadvantages of both the ordinal and P/F grading systems with their advisers before selecting an option.

Ordinal grades provide a more definitive record of student performance and are therefore useful in future job and academic applications. An advantage of the P/F system is that students will not be inhibited from taking courses of interest outside their areas of concentration for fear of obtaining poor grades. Also, some students already have advanced professional degrees or job experience which makes taking more than the required number of ordinal credits unnecessary for their future plans.

In selecting grading options, students must consider both minimum School distribution requirements and any additional requirements set by their department or program.

**Changes in Grades**

Final authority for the designation of grades rests with the principal instructor in each course. Once a grade has been reported in writing to the Registrar's Office, the following applies:

1. If the grade in question is to change an incomplete to a final grade, it is sufficient to send this grade to the Registrar.
2. If the grade change is because of a clerical error in reporting the original grade, then the new grade and a letter explaining the circumstances must be sent by the instructor to the Dean for Academic Affairs, who may authorize the Registrar to change the grade.
3. If the grade change is due to an error in judgment or because of new information regarding the student's performance, the instructor must submit the request as above to the Dean for Academic Affairs. In addition to the Dean's approval, the grade change must be approved by the Committee on Admissions and Degrees.
4. For grade changes other than resolving incompletes, the instructor is ordinarily expected to indicate that he or she has reviewed the work of the other students in the course in order to determine that no similar errors have been made and gone uncorrected.

## Tuition and Fee Schedule

The tuition and fees for the academic year 1985-1986 are listed below:

| | |
|---|---|
| *Degree Candidates* | |
| Full-time resident tuition | $9,150* |
| Half-time resident tuition (Up to 25 credit units per year; credits over 25 per year will be charged $225 per credit.) | 4,740* |
| Doctoral full-time reduced tuition | 4,740* |
| Doctoral half-time reduced tuition | 2,530* |
| Doctoral facilities fee (resident) | 1,430* |
| Nonresident guidance fee (less than half time) | 550 |
| *Leave of Absence* | |
| Active file fee for each term that student is on leave | 50 |
| *Special Students* | |
| Enrolled for 10 or more credit units — Tuition as stated above for full-time or half-time attendance. | |
| Enrolled for 6 to 9 credit units — | |
| First credit unit of work per term | 390* |
| Each additional credit unit of work per term | 225 |
| Enrolled for 1 to 5 credit units — | |
| Per credit unit of work per term | 225 |

*These starred amounts include the UNWAIVABLE annual University Health Service fee ($325) for all *resident* students enrolled for 6 or more credit units.

| | |
|---|---|
| *Summer Session (1986)* | |
| Five credit unit summer program for degree candidates who register and receive credit for research or supervised study during summer session. Tuition for summer school courses may not be credited toward any tuition requirements for the degree. | 1,125 |
| *Dissertation Fee* | |
| Final doctoral tuition fee. For the registration period in which a dissertation is formally approved and accepted by the Department and Committee on Admissions and Degrees, a doctoral degree candidate must have paid at least half of the current facilities fee. | 360 |
| *Late Fees* | |
| Late registration fee | per week 25 |
| Late course form fee | per week 25 |
| *Drop/Add Fee* | |
| Within published deadlines — per petition | 20 |
| After published deadlines — per petition | 30 |
| *Hospital Insurance* (Blue Cross/Blue Shield) | 330 |

Blue Cross/Blue Shield (BC/BS) insurance is charged separately. All students are automatically enrolled in the BC/BS plan and it is compulsory for nonimmigrant foreign students. U.S. students who have comparable medical insurance *and* submit a waiver form by September 26 (for the fall term) or February 5 (for the spring term) may elect not to enroll in BC/BS. *Students who fail to file waivers will be responsible for any fees billed for that term.* Waivers for BC/BS insurance are approved *only* by the Director of the University Health Services. A BC/BS student insurance plan provides coverage for many costs of medical care not offered at the University Health Services. Coverage under this plan extends from September 1 through August 31. Enrollment is possible only in September and January.

Nonresident doctoral students are not automatically enrolled in any Harvard health plan. Nonresident doctoral students who wish to have BC/BS insurance coverage must file special forms with the Student Insurance Office in Holyoke Center by September 26 (for the fall term) or February 5 (for the spring term). Obtaining coverage is optional for students who will be residing outside the United States. However, this BC/BS insurance is mandatory for all nonimmigrant foreign students in nonresident status *within* the United States.

**Final Doctoral Tuition Fee**

For the registration period in which a dissertation is formally approved and accepted by the department and the Committee on Admissions and Degrees, a Doctor of Science or Doctor of Public Health candidate must have paid at least half of the then-current facilities fee. The fee for 1985-1986 is $360. Students graduating in November or March who wish to maintain health insurance during the final term are required to pay one-half the Blue Cross/Blue Shield fee ($165). Upon the award of the degree, coverage terminates retroactively to the beginning of the term; the student is then refunded the amount of the health insurance fees and is sent a non-group bill by Blue Cross/Blue Shield.

## Payment of Fees

No student will be permitted to register in any term until all money due from prior term bills and at least one quarter of the commencing term's tuition and fees have been paid in full or satisfactory arrangements have been made either through the School of Public Health's Financial Aid Office, or through the Special Billing Department of the Harvard University Student Term Bill Office (for students requiring third-party billing). Students not enrolled in the extended payment plan must pay the full amount by the dates indicated in order to register. To register for the extended or monthly payment plan (four each term), students must sign the enrollment card at the Student Term Bill Office and pay one quarter of the tuition for that semester plus a $25 processing fee per term.

In event of withdrawal, tuition will be prorated according to the schedule on page 105. All other bills for tuition and fees will be issued and payable as follows:

*Student term bills for the fall term* will be issued on July 20 and will be payable *in full* by August 16.

*Bills for the spring term* will be issued in early January, and will be payable *in full* at the time of spring course registration.

Students who are candidates for degrees must have paid all bills to the University at least three days before the day upon which the degrees are to be voted by the Faculty of the School of Public Health. Graduating students who make payments late in the term should obtain a receipt and bring it to the Registrar's Office prior to the degree voting day.

A student who leaves the University for any reason whatever must pay all charges against him or her immediately upon receipt of a bill from the Student Term Bill Office. Every student is held responsible for the payment of fees until he or she has notified the Registrar *in writing* of his or her intention to withdraw from the School. A student who fails to submit written notification of withdrawal is liable for tuition and fees for the term.

A student who leaves the School during the academic year is responsible for tuition charges in accordance with the following:

| **Leaves by** | | **Percent of Total** |
|---|---|---|
| *First Term* | *Second Term* | **Semester Charges** |
| October 4 | February 21 | 25% |
| November 8 | March 21 | 50% |
| December 6 | April 18 | 75% |

Students leaving after December 6 and April 18 of the first and second terms, respectively, are responsible for full tuition charges. Students receiving financial aid should read the information on page 105 regarding refunds.

Courtesy students, courtesy-special students, and special students enrolled for less than 10 credits are required to pay all tuition and fees for the term in full when they register. Payment is not refundable.

Ordinarily, term bills are sent to the student at his or her local address unless the Student Term Bill Office is requested in writing to send them elsewhere. Any student whose indebtedness to the University remains unpaid on the date fixed for payment may be deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled.

## Registration and Tuition Guidelines

### Degree Candidates

After admission to the Harvard School of Public Health (HSPH) and until fulfillment of the requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

1. Resident students
2. Nonresident doctoral students
3. Students on leave of absence

All degree candidates must pay the appropriate tuition rate for each registration period as described on page 103; tuition may not be paid on a "per credit" basis, except for half-time degree candidates who take over 25 credit units for the year. To qualify for an educational loan, a student must be registered for no less than a half-time study program.

Tuition for summer school courses and additional tuition paid for credits over 25 per year may not be credited toward any tuition requirements for the degree.

1. *Resident Students*

   All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities must register as resident students. Master's degree students are charged full tuition for the entire period in which they are in full-time attendance.

   *New Doctoral Students*

   a. Students who have not previously attended HSPH will be charged a minimum of two years of full tuition and one year of reduced doctoral tuition.
   b. Students who have received a one-year master's degree from HSPH within three years of enrolling in a doctoral program in the same discipline as that of their HSPH master's degree will pay a minimum of one year of full tuition and one year of reduced doctoral tuition.
   c. Students who have received a two-year master's degree from HSPH within three years of enrolling in a doctoral program in the same discipline as that of their HSPH master's degree will pay a minimum of one year of reduced doctoral tuition.
   d. Students who have received a Master of Public Health degree and a Master of Science degree from HSPH within three years of enrolling in a doctoral program in the same discipline as one of their HSPH master's degrees will pay a minimum of one year of reduced doctoral tuition.
   e. In the year(s) following the year in which reduced doctoral tuition is paid, a facilities fee will be charged all doctoral students. This fee enables students to use Harvard academic facilities and the University Health Services.

   *Returning Doctoral Students*

   Currently enrolled doctoral students will not be granted retroactive credit for tuition previously paid. However, current students who have paid three years of full-time tuition will be charged only the facilities fee.

   *Part-Time Resident Students*

   Any degree candidate who registers for less than full time must in any event fulfill the full-time, full-tuition requirements for the degree.

*Full-Time and Part-Time Student Status*
For degree candidacy, financial aid, loan requirements, and immigration, definitions of what constitutes a full-time student are required. (See information on degree candidates on page 94).

The following guidelines will be used.

a. Students who are accepted to two one-year programs (40 credit units each) and who are awarded one degree at the end of the first year must fulfill the requirements for a one-year (40-credit) program during the second year. Credits may not be carried over from the first program into the second.

b. Persons in a 60-credit master's degree program must follow the guidelines for students in an 80-credit degree program, except that all 60 credits must be taken within three consecutive terms.

c. Exceptions to these guidelines are not encouraged. Students requesting an exception must petition the CAD.

2. *Nonresident Doctoral Students*
Doctoral students who no longer reside within a 50-mile radius of Boston, who are engaged in less than half-time work on the degree, and who have received permission from their department and the Committee on Admissions and Degrees to pursue a portion of their programs as nonresidents, will be charged the nonresident doctoral fee. Students in this category normally will have completed payment of at least the required two years of full-time tuition and one year of reduced doctoral tuition before applying for nonresident status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in nonresident status.

Nonresident doctoral students are charged the nonresident doctoral guidance fee, which covers periodic consultation with the student's doctoral adviser, but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, as noted above, a student registered for less than a half-time study program may not qualify for deferment of an educational loan. Upon expiration (or earlier termination) of CAD permission for nonresident status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

3. *Students on Leave of Absence*
Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the School, and who will be making no use of Harvard facilities, must apply to the Registrar for a leave of absence. Leaves of absence are ordinarily granted for a maximum of two registration periods and require approval of the student's department and the CAD.

Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon earlier expiration (or earlier termination) of CAD permission for leave of absence, students will be charged the appropriate tuition rate.

**Termination of Degree Candidacy**

Students who do not intend to register in any one of the categories noted above must terminate their candidacy for the degree. Such students are required: (1) to file in the Registrar's Office a written notice of intent to withdraw; (2) to inform their department; and (3) to inform the Financial Aid Office or the Harvard International Office, when appropriate. If students do not terminate their degree candidacy formally but fail to register for a full term or longer, degree candidacy will be terminated automatically. Students who are withdrawn must apply for re-admission.

The CAD, with departmental recommendation, may terminate a student's degree candidacy on the basis of unsatisfactory performance in course work. Candidacy also will ordinarily be terminated in the case of a student who has exceeded the five-year limit for completion of degree requirements following registration as a doctoral candidate. Doctoral candidacy may be terminated as a result of failure to submit an acceptable proposal for the thesis. Also, the Administrative Board may recommend termination of candidacy in matters involving academic discipline.

A student who wishes to reactivate degree candidacy should file an application for re-admission, which must be approved by the department and by the CAD. Prior to re-admission, the student must pay any outstanding bills to the University, as well as the then-current active file fee for each registration period that has elapsed since the termination of candidacy.

**Nondegree Candidates**

Requirements for admission to nondegree programs are described on page 92.

Special students registered for full-time or for half-time study programs pay the corresponding tuition rate; those registered for less than half time pay tuition on a "per credit" basis as outlined in the tuition and fee schedule.

**Field Studies**

Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

## Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. The following are minimum amounts estimated that students will need in the academic year 1985-1986 to cover expenses for approximately 10 months.

A single person will need at least $20,000, in addition to relocation costs, to cover the cost of tuition ($9,150), health insurance ($330), books and supplies ($600), rent ($3,900), local travel ($600), and other living expenses ($5,420) for approximately 10 months. A family of four will need at least $28,165, in addition to relocation costs, to cover tuition ($9,150), health insurance for student ($330), books and supplies ($600), rent ($6,300), local travel ($600), and other living expenses ($11,185), including medical care for spouse and children.

Applicants who plan to enroll in a two-year program should allow for proportionate additional expenses for the summer months and a four to six percent increase for the academic year 1986-1987.

## Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the School for its full-time students and their families from the United States and abroad. Located at 199, 203, and 207 Park Drive, within walking distance of the School, the House consists of 72 individual apartments, each with a kitchenette and bath.

All apartments are rented furnished with basic items except for linens, blankets and kitchen utensils. No unfurnished units are provided. The monthly rent charge includes all utilities — hot water, heat, gas, and electricity — but not telephone service.

Applications should be submitted by May 15, although late applications will be considered as long as space is available. For application forms and more detailed information, write to Carol O'Connell, Office of Student Affairs, Room G-4, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

The Office of Student Affairs maintains an up-to-date list of private housing and local real estate agencies.

The Harvard University Housing Office in Cambridge arranges for housing in University-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, Massachusetts 02138. A copy of the student's letter of acceptance from the School must be enclosed to prove affiliation. This office also maintains listings of apartments and houses not owned by the University. These listings must be viewed in person; information is not given out by mail or telephone.

## Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses. Medical care is provided through the facilities of the Medical Area Health Services, located in Vanderbilt Hall. The hospitalization insurance extends for a period of 12 months from September 1, and covers hospitalization in Boston and elsewhere. Nondegree, post-doctoral research and teaching Fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

In addition, a prepaid program for spouses (including maternity benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Health Plan, extends for a period of 12 months from September 1, and provides full semiprivate hospitalization benefits. A descriptive brochure about the plan for dependents is sent to students before registration or may be obtained from the Registrar.

Any illness necessitating absence from classes should be reported to the Medical Area Health Services by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Services, on call 24 hours a day, can be reached through the switchboard of Harvard University.

For further information, contact the Director, Medical Area Health Services, 275 Longwood Avenue, Boston, Massachusetts 02115. Telephone: 617-732-1370.

## Loans and Fellowships

The Harvard School of Public Health is a participant in the Harvard University Guaranteed Student Loan (GSL), PLUS loan, and National Direct Student Loan (NDSL) programs. These programs permit a student who is either a U.S. citizen or a permanent resident to borrow up to $5,000 a year under the GSL program. Providing certain eligibility requirements are met, a student may borrow an additional $3,000 a year through the PLUS or NDSL programs.

In addition to the above loan programs, a full-time student may borrow through the Health Education Assistance Loan program (HEAL), a federally insured loan program for a graduate student who is either a U.S. citizen or a permanent resident. Eligible lenders are participating banks.

Some fellowship support is available through departments and special programs from federal and nonfederal sources for qualified students in a variety of fields. In addition, there are funds available through the College Work-Study program for eligible full-time students.

A student who has defaulted on a federal loan program authorized by the Higher Education Act (GSL, HELP, NDSL, or PLUS) is ineligible for additional loans or funds through the College Work-Study Program. Depending on the circumstances, exceptions may be made if the student has repaid the defaulted loan in full.

Retenton of awards and loans is contingent upon the student maintaining the minimal acceptable grade point average and the required number of credit units.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to NSDL, GSL and PLUS loans. These loans must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

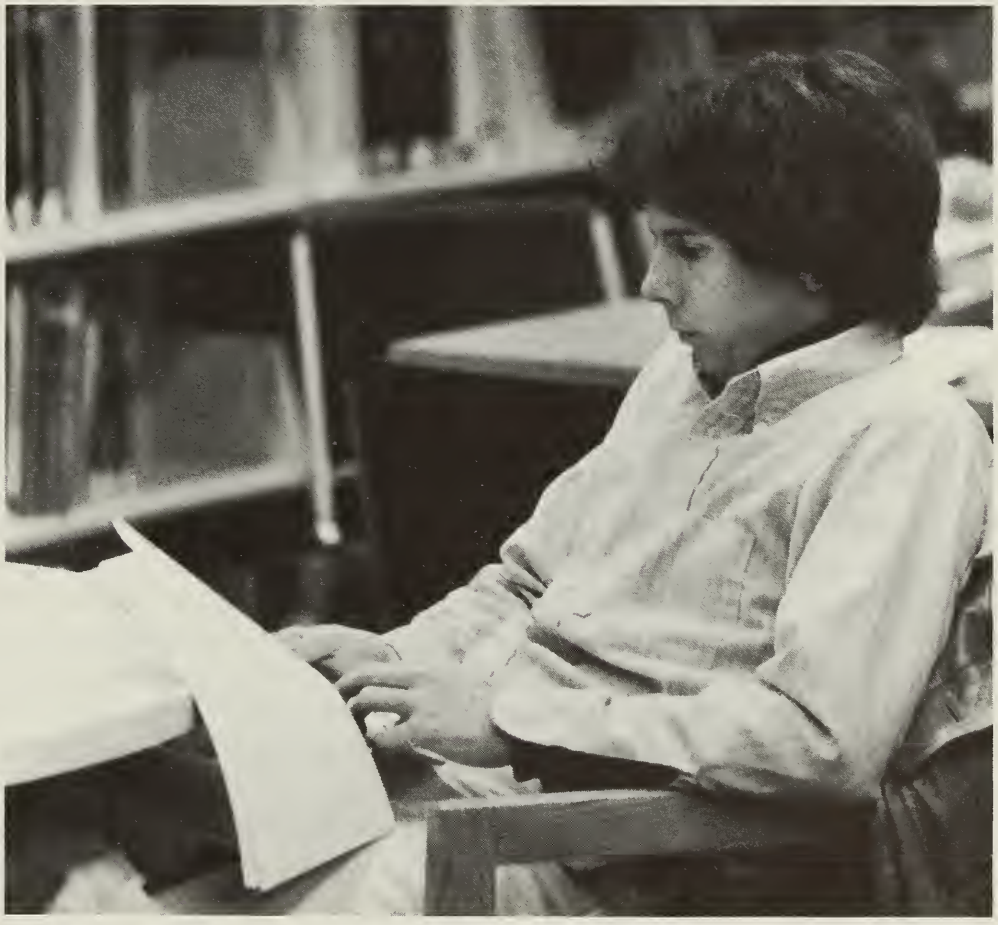
Harvard University's policy is to make decisions concerning applicants, students, faculty and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable anti-discrimination laws.

Detailed information about fellowships and loans can be obtained by writing to Ms. Laura R. Markowitz, Director of Financial Aid, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

## Scholarships

The Committee on General Scholarships and the Sheldon Fund administers a number of scholarships which are open to applicants from all Schools of the University. These include Travelling Fellowships and Restricted and Unrestricted Scholarships. Eligibility for many of these funds is very specific and varies according to terms of donors. Nomination for these scholarships must be made by the Director of Financial Aid. For a complete list of University Scholarships, applicants should consult the General Catalogue Issue of Harvard University.

Some awards are made available through departments or the Financial Aid Office and are based on scholastic achievement. One example is the John E. Thayer Scholarship, which is the Bequest of John E. Thayer, the income to be paid "to the ten most meritorious scholars in Harvard University every year — the income shall only be paid to such meritorious scholars as who actually need the same." This award is determined by the Committee on Financial Aid following the first semester of each academic year. The award is based on a review of the grade cards of second-year students who have elected the ordinal grading system and a needs analysis based on financial records on file in the Office of Financial Aid.



## Office for Students

The Office for Students, headed by the Associate Dean for Students, includes the Registrar, who also directs admissions, the Director of Financial Aid, the Director of Professional Development, and the Director of Student Affairs.

The Director of Student Affairs attempts to meet the special needs of students, plans orientation and Commencement, acts as liaison with the Alumni Office, and oversees career services. The Office maintains up-to-date information on housing, child-care facilities, transportation, and athletic outlets in the Medical Area, Boston and Cambridge.

The Coordinator of Career Services provides career counseling; maintains a resource center containing job listings and files on health care organizations; contacts potential employers to acquaint them with programs at the School; and requests information about job openings. Current positions (permanent, summer and part time) are posted and a bi-weekly Job Opportunities Bulletin is distributed to all students. Assistance in writing resumes, arranging for interviews and exploring career opportunities is available. The activities of the Office complement the efforts of departments, programs and faculty advisers. Data collected about positions and salaries of graduates are available to prospective students.

The Director of Student Affairs is responsible for assisting handicapped students in adapting to life at the School.

Further information can be obtained from the Director of Student Affairs, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, Massachusetts 02115.

**Lockers and Mailboxes**

During Orientation, the Office of Student Affairs assigns each student a mailbox and any student who requests one, a locker with a combination lock. The lockers are located on the ground, second and fifth floors of Kresge; the mailboxes are on the G-level of Kresge. Some departments also provide student mailboxes. Announcements about course changes, student events, Student Coordinating Committee business, and numerous other items of School concern are distributed through the HSPH mailboxes. In addition, faculty members often send notices to individual students through this internal mailing system. It is important to check mailboxes regularly for these communications.

**Bulletin Boards**

Many items of interest cannot be distributed individually to each student and are instead announced by postings on appropriate bulletin boards. Accordingly, it is useful to be aware of the variety of bulletin boards and to make a regular practice of scanning them. An important bulletin board to check is outside the Office of Student Affairs—it contains important academic notices from the Dean's and the Registrar's Offices. In addition, many listings from potential employers are listed on the bulletin board in the G-level area. On the wall approaching the cafeteria on the first floor of Kresge is another set of bulletin boards, containing

miscellaneous postings by students or persons outside the School. Next to the elevators on most floors in Kresge is a bulletin board which announces academic events and public or professional presentations in the Medical Area.

Most departments maintain a bulletin board where relevant material is posted, including job inquiries from employers.

**Child Care Facilities**

Although there are a number of child care facilities in the area, they are quickly filled, so arrangements should be made as early as possible. Child care facilities are located in Cambridge and the Medical Area. For further information provided by the Office of the Child Care Adviser, call 495-2851 or 732-1489.

## Protection of Rights and Privacy of Students

The School of Public Health has adopted policies and procedures in compliance with the Family Education Rights and Privacy Act of 1974, which is commonly referred to as "the Buckley Amendment." Copies may be obtained from the Registrar's Office, Room G-4, 677 Huntington Avenue.

The Buckley Amendment was designed to protect the privacy of student educational records, afford students and former students the right to inspect the records that directly concern them, and provide students and former students the right to question and challenge the content of their educational records through formal hearings.

General records are compiled by the Admissions Office. These include materials furnished by the student, such as application forms and personal statements, references, transcripts, and other materials from third parties. These files are not available to students until they register at the School. Once a student registers, these folders are transferred to the Registrar's Office, where they are held until the student graduates. Copies of any correspondence with the student are added to these folders. In addition, if a student applies for financial aid, separate records of these transactions are kept in the Financial Aid Office.

Those at the School who have access to student records are the student's academic adviser, the student's department chairman or program head, departmental evaluation committees where appropriate, the Committee on Admissions and Degrees, and the Dean's Office. Students may request to see their records any time after registration by going to the appropriate office and requesting an appointment to inspect the records. Students wishing to discuss or question their records may speak with the Director of Student Affairs. If a student wants to change or expunge something from the file, he/she should make a written request and file it with the Director of Student Affairs. A committee, comprised of the Director of Student Affairs, the Registrar and the Associate Dean for Students, will consider the request and make a decision as to the appropriate action. If the requested change is not granted, the student may place in the file his/her explanation and objection to the information in question.

If a student believes that the School has failed to comply with the provisions of this amendment, or the implementing regulations, he or she may file a complaint with the Department of Education, Washington, D.C.

The following information is considered "directory information" and will be released on request without the student's specific written consent: dates of attendance, program and field in which they are enrolled, full- or part-time status, degrees received, address and phone number (unless the student specifically asks at registration that these not be released), date and place of birth, degrees received from other institutions, and name of academic adviser. Transcripts of academic work, or grades in any form, will not be released without the student's specific authorization, except to appropriate faculty advisers and committees with responsibility for students' academic progress. Outside organizations or institutions are never given access to student records, but are permitted to interview the Registrar regarding the student's record upon presentation of signed consent forms. In such cases, every attempt is made to protect the privacy of the student and to prevent coercion by prospective employers.

Currently enrolled students who are applying for other programs at the School have the right to request that materials in their current student folder not be made available to the admissions committees considering applications.

## Student Conduct

Students are expected to respect the rights of the other members of the Harvard School of Public Health community and to maintain high standards of ethical conduct and personal integrity. Students are expected to abide by all city, state and federal laws, as well as University regulations, and infractions of the same may result in disciplinary action by the School.

## Disciplinary Procedures for Students

Incidents of conduct inappropriate to a public health professional shall be reported at once to the Associate Dean for Students or the Director of Student Affairs. Such misconduct includes submitting work that is not the student's own, cheating on an examination, failing to cite sources on a paper, and submitting false credentials on an application or incorrect data on a financial aid form. A student may not submit the same paper in more than one course without the prior written permission of the instructors involved.

Anyone observing an incident of academic dishonesty or unprofessional conduct should report it promptly to the Associate Dean for Students or the Director of Student Affairs. The Associate Dean is responsible for initiating an investigation. If disciplinary action is under consideration, the Administrative Board becomes involved. The specific procedures to be followed can be obtained in writing from the Associate Dean for Students or the Director of Student Affairs.

Disciplinary actions which may be taken include probation, suspension for a period of time, and expulsion.

## Grievance Procedures for Students

For both legal and policy reasons, it is desirable that students at the School of Public Health have an established and approved mechanism by which serious grievances may be promptly and equitably resolved.

The following procedures are to be used by students for the resolution of grievances alleging unfair action on the part of the University administration or faculty, including discrimination on the basis of race, color, religious belief, sex (including sexual harassment), national or ethnic origin, handicap, or age.

### The Informal Resolution of Grievances

A student with a grievance should initially take the matter to one of the following people: his or her adviser, department chairman, Director of Student Affairs, Associate Dean for Students, Affirmative Action Officer, or other appropriate faculty member or administrator. If the grievance cannot be resolved satisfactorily between the student and the initial faculty/administration contact, the student may, at his or her discretion, seek resolution via the formal procedure outlined below. The person investigating the grievance shall, at the request of the student, make a written report available to the *ad hoc* grievance committee in the event that resolution is not possible in the informal phase.

### The Formal Grievance Procedure

An aggrieved student may, at his or her request, seek resolution of the grievance via the formal procedures outlined below.

1. A formal grievance is a complaint in writing from the student to the Associate Dean for Students (in the event that the grievance is against the Associate Dean for Students, the written complaint shall go directly to the Dean of the School) asking that an *ad hoc* grievance committee be appointed. The written complaint should be filed within two months of the event to which it refers and should include the following:
   a. Statement of the allegation
   b. Description of the alleged facts
   c. Name or names of the person(s) thought to be responsible for the alleged events and
   d. Other facts considered to be pertinent to the case.
2. The Associate Dean for Students will then appoint an *ad hoc* grievance committee consisting of a representative of the Faculty Council, a member of the School's administration, and a student, chosen by the Student Coordinating Committee, who has completed at least one semester at the School. This *ad hoc* grievance committee will be appointed and convened within ten (10) working days of receipt by the Associate Dean for Students of the written complaint; in all cases, confidentiality shall be maintained during the selection and appointment process. A quorum will require that all members be present. The Associate Dean for Students will appoint the chairperson of the committee.

3. The *ad hoc* grievance committee shall investigate the grievance. This investigation shall include, but need not be limited to, the following:
   a. Meeting(s) with the person aggrieved and the person(s) (or department) grieved against and
   b. Consultation with such others as the *ad hoc* grievance committee shall deem necessary to provide a thorough investigation of the grievance, including scientific ramifications or concerns, and other mitigating or extenuating circumstances that bear upon the situation.
4. The *ad hoc* grievance committee shall expeditiously consider the facts of the case and present a report to the Dean of the School. The report shall include findings of facts and recommendations, if any. Every precaution shall be taken to ensure the confidentiality of information obtained at meetings of the *ad hoc* grievance committee. The Committee shall also make every effort to conclude the investigation quickly enough to prevent the situation from becoming irreversible and to take any needed remedial action.
5. Upon receipt of the report from the *ad hoc* grievance committee, the Dean of the School may do one of the following:
   a. Take whatever action, if any, he feels is warranted, using the report of the *ad hoc* grievance committee as advisory information or
   b. Return the matter to the *ad hoc* grievance committee for further consideration. This action will return the grievance to Step 3 of this procedure.
6. The final action of the Dean of the School constitutes the formal completion of the grievance procedure. The *ad hoc* grievance committee will then be discharged. Final action of the Dean of the School will be communicated to both the person aggrieved and the person(s) (or department) grieved against. Once the procedure is completed, all records of the meetings of the *ad hoc* grievance committee and the final report of the committee will remain in the possession of the Dean and will be held in strict confidence.
7. Any request for exceptions to the foregoing should be addressed to the Associate Dean for Students. By mutual agreement of the Associate Dean for Students and the student, the stated formal procedure may be waived in favor of a procedure more appropriate to a particular circumstance.

## Alumni Association

The School's Alumni Association has a membership of approximately 4,500 graduates located throughout the world. The Association is governed by an elected Council which meets twice a year, once in the fall at the APHA annual meeting, and once in the spring at the School. In 1977, the Association initiated the Margaret Dale Penrose Scholarship Fund, which has since been permanently endowed with gifts from Alumni and friends and a matching amount from the School. In 1981, the Association was instrumental in the establishment of an Alumni Annual Fund for Student Assistance to which alumni contribute annually. In addition to helping students in dire financial need, the Fund supports Alumni Scholarships that are awarded annually to doctoral students selected on the basis of merit and financial need. For information about alumni activities, contact the Alumni Office.

# *Courses of Instruction*

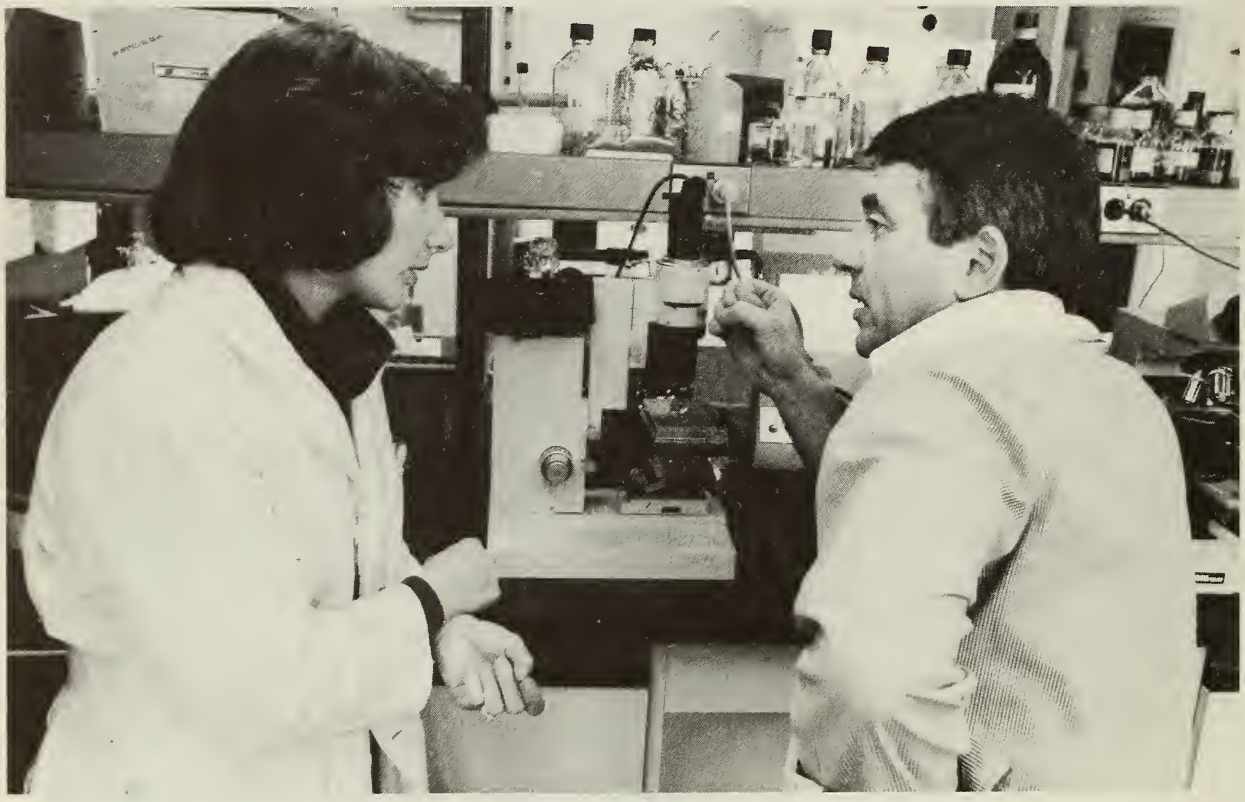
In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," "e," and "f" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b," second period (fall); "c," third period and "d," fourth period (spring). The letters "e" and "f" indicate supervised special studies or field observations, usually during the one-week period between fall and spring terms or during the week of spring recess.

The credit assignment is given in units following the statement of number and length of sessions per week. Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, such as Arts and Sciences, and that the course credit is provided through that Faculty as well as through the School of Public Health, e.g., MCH 214a,b (HMS Geriatrics 702) or POP 209a,b (Biology 195).

Every effort is made to ensure that the following list of courses is complete and accurate at the time of publication. However, the School reserves the right to make changes in the courses, instructors and requirements announced in this *Register.*

The listing of courses in this *Register* implies no guarantee that a student will in fact be able to enroll in all courses of interest to that student. The course schedule is arranged insofar as possible to accommodate School and departmental requirements. However, students may encounter scheduling conflicts, particularly with electives and with courses offered in other Faculties. Students should also be aware that they must satisfy any prerequisites listed in a course description before they will be permitted to enroll in that course.



*Dr. Juliet Fuhrman, postdoctoral Fellow, and Dr. Willy Piessens, of the Department of Tropical Public Health, examining cloned T-cell cultures.*

Through its Office of Continuing Education, the School of Public Health offers a variety of short-term technical courses for professional public health personnel. Courses currently confirmed for presentation during the 1985-86 academic year are listed below. Additional information can be obtained from the Office of Continuing Education, Harvard School of Public Health (Telephone: 617-732-1171).

## Occupational Health

**Safety, Health and Ventilation Issues in the Laboratory**
June 25-27, 1985
**Health Effects of Asbestos: Fundamentals and Controversies**
June 26-28, 1985
**Risk Analysis in Occupational Health**
March 25-27, 1986
**Certification of Biological Safety Cabinets**
July 22-27, 1985
**Fundamentals of Industrial Hygiene**
October 28-November 1, 1985
March 24-28, 1986

## Nuclear Safety and Radiation Protection

**Environmental Radiation Surveillance**
July 15-19, 1985
**Occupational and Environmental Radiation Protection**
August 19-23, 1985
March 24-28, 1986
**Advanced Course in Nuclear Emergency Planning**
July 14-18, 1986
**Radiation Protection Instrumentation**
May 12-16, 1986
**In-Place Filter Testing Workshop**
June 9-13, 1986
**Planning for Nuclear Emergencies**
June 9-13, 1986
**Biological Effects of Ionizing Radiation**
June 17-19, 1986

## Environmental Management

**Environmental Radiation Surveillance**
July 15-19, 1985
**Risk Analysis in Environmental Health**
September 9-11, 1985

## Control of Indoor Environments

**Safety, Health and Ventilation Issues in the Laboratory**
June 25-27, 1985
**Clean Room Technology**
August 6-8, 1985

## Medical Sciences and Management

**Health Effects of Asbestos: Fundamentals and Controversies**
June 26-28, 1985
**National Issues in Obstetrics: A Public Health Perspective**
October 4-6, 1985
**Health and Safety Issues in High Technology Industries**
October 17-18, 1985
**Program for Health Systems Management**
October 27-November 8, 1985
**Program for Chiefs of Clinical Services**
January 19-31, 1986
**Biological Effects of Ionizing Radiation**
June 17-19, 1986

**ID 209a. Health Services in Developing Countries**
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Dr. Koch-Weser.
Provides a broad overview of health and health care problems in developing countries. Central issues include: ecologic, environmental and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities.
Preference given to students who have previously been involved in international health activities.

**ID 210d. Introduction to Educational Design in Health Fields**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Koch-Weser, Dr. Vanderschmidt.
An introductory course designed for students preparing for careers in the education of health professionals. Provides a systematic approach to instructional design through a model program which includes analysis of professional responsibilities and performance, specification of educational objectives, design of instructional activities and evaluation of the educational process and outcome. Examples are drawn primarily from the fields of community medicine and public health.

**ID 212c. Biomedical Writing**
Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.
Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, clear and concise scientific prose, and understandable tables and figures — are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.
Enrollment limited to 10 students and requires approval of the instructor at least two weeks before the quarter begins. This course will be given pass/fail.

**ID 215c,d. Advanced Seminar in Law and Public Health**
Lectures, discussions, student presentations. *One 3-hour session each week. 5 units.* Dr. Curran, Guest Lecturers.
Provides an opportunity for law-trained students in the Public Health for Lawyers curriculum option and other qualified students to work together and exchange experiences in application of legal issues to current public health problems. The seminar will be the focus for a legal research paper on a topic of health law mutually determined by student and instructor. Legal issues will concentrate on matters of importance in representing health organizations in governmental and private sectors. Enrollment subject to approval of the instructor.

**ID 216c,d. Health Aspects of Nuclear War** (HMSC-PMCE 709)
Lectures. *Two 1-hour sessions each week. 2.5 credits.* Dr. Abrams, Dr. Lown, Dr. Mack.
Designed to introduce students to the medical dimension of thermonuclear weapons and war. Topics will center about the medical consequences of nuclear weaponry and war. Background material will include brief surveys of the physics of weaponry, modern weapon delivery systems, biological and ecological effects of radiation. Consequence of use of tactical weapons, limited nuclear war and full-scale nuclear exchange will be considered. The medical needs, available facilities and medical and psychosocial problems of survivors are discussed.

**ID 217c,d. Capitalism, Socialism and Public Health**
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Dr. Levins, Visiting Lecturers.
Contrasts the analysis of problems in public health, nutrition and population by Marxist and capitalistic social and economic theories. Topics include: Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

**ID 220c,d. Workshop: The Design of Development Programs and Projects** (KSG-S-562)
Seminar. *Two 1½-hour sessions each week. 5 units.* Dr. Thomas.
Draws heavily on students' own experience and working knowledge of analytical techniques. Attempts to synthesize practical and educational experience to provide the student with a stronger set of skills for future participation in development programs. Emphasizes both the analysis of issues from a political economy perspective and the practical skills of group work, negotiation, memo writing, and verbal presentation in simulated practical situations. Students are expected to have prior experience in, and career commitment to the field of development.
Enrollment subject to approval of the instructor.

**ID 221d. Case Studies in Decision Making in the Control of Diseases of Public Health Importance**
Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.
Cases drawn from domestic and Third World sources are studied from the standpoint of decision makers in the control of diseases of public health importance. Students in teams will propose solutions to problems after utilizing information drawn from a spectrum of sources, including: molecular biology, host-parasite interactions, epidemiology, management of resource allocations, cultural and socio-economical constraints.
Enrollment limited to 50 and subject to approval of the instructor. No auditors.

**ID 225d. A Case Study in Urban and Industrial Health Planning in a Developing Country**
Lectures, small seminars, workshops. *Two 2-hour sessions each week. 4 units.* Dr. Nichols.
Curative and preventive medicine requirements for a large industrial project and surrounding city are studied, together with essential public health support services. Planning includes: definition of the problem; description of health hazards and load on the health services; alternate solutions; enabling and functional linkages required; functional programming, including proximity matrices, facilities, staffing, operational support, management and administration requirements, costing, and implementation.
Enrollment limited to 40 and subject to approval of the instructor. No auditors. Ordinal grades only.

**ID 230b. Health of Community Populations**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gortmaker, Members of the Faculty, Guest Lecturers.
Principally targeted for those with interests in biostatistics, epidemiology, health policy and management. Focuses on the common diseases particularly affecting persons living in poverty or near poverty conditions in urban America. Discusses the impact of socio-economic, cultural and environmental factors upon ill health. Provides an overview of the types of data available from which to identify community health problems. Presents and evaluates case studies from local communities.
Prereq. HPM 104a or equivalent.

**ID 232c,d. Change Strategies at the Community Level**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. J. L. Brown.
Assists students in analyzing and understanding functional aspects of communities, and in understanding the role of various institutions with respect to health, illness and the quality of life in communities. Analyzes variables which contribute to success or failure in altering health conditions, and the roles which health professionals play in altering the health status of populations.
Prereq. Present or past clinical/field experience.

**ID 330f. Field Trip**
*Three-day period between c and d terms. 1 unit.* Dr. Nichols.
*Centers for Disease Control, Atlanta, Georgia.*
The Centers for Disease Control (CDC) is a unique institution with many public health functions relevant to the educational and research interests of domestic and foreign students.
This field trip will give students an overview of the activities of the CDC, as well as an opportunity to meet individually with professional staff at CDC. Lectures and tutorials are provided related to the various disciplines at CDC, including occupational diseases, surveillance systems, epidemiology, control measures for both chronic and infectious diseases, and CDC's role in international health. Other topics will be arranged depending on the interests of the group. A resume of the material covered is required of each student.

**BEH 201a. An Introduction to the Role of Behavioral Sciences in Public Health**
Lectures. *One 1½-hour session each week. 1.25 units.* Dr. Wechsler, Dr. Gortmaker, Guest Lecturers.
Covers major areas of concern to the behavioral scientist. Topics will include: the role of the media in health and illness promotion, inequality in health care and health status, cultural factors in seeking health care, the impaired physician, and the doctor/patient relationship.

**BEH 202b. Health and Behavior**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Reviews socio-demographic and socio-psychological factors in the initiation, maintenance and cessation of health-related behaviors. Considers behavior change strategies for primary and secondary prevention of disease from a health policy perspective and focusing on issues of compliance with medical regimens. Primary instructor is Dr. Daltroy.

**BEH 205c,d. Behavioral Sciences in International Perspective**
Seminars, lectures. *One 2-hour session each week. 2.5 units.* Dr. Pierce.
Offers a survey of various behavioral sciences theories and practices. The aim is to demonstrate how such information can be modified for application to problems which are common to health problems in human society, regardless of locality. Readings, seminars, lectures, discussions, and written assignments will cover three broad areas: health, communication and cooperation.

**BEH 214d. Behavior/Lifestyle Change and Risk Factor Alteration: Introduction to Methods**
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department.
Focuses on the planning, implementation and evaluation of intervention programs addressing the primary prevention of disease. Examines risk factor reduction and life style changes in promoting health. Primary course instructor is Dr. Benfari.

**BEH 215c. Inducing Social Change**
Lectures. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.
Designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions and case illustrations.

**BEH 216c,d. Case Studies in Health Promotion**
Case studies. *One 2-hour session each week. 2.5 units.* Members of the Department.
Examines health promotion/education interventions in the U.S. and developing nations. Teaches techniques of intervention design using print and non-print media. Applies basic principles of education and social psychology.

**BEH 220c,d. The Epidemiology of Pathological Behaviors: Problems, Concepts and Methods**
Seminars. *One 3-hour session each week. 5 units.* Dr. Wechsler.
Surveys the epidemiology of pathological behaviors and social pathologies. Topics include: psychiatric disorders, alcoholism and drug addiction, suicide, antisocial behavior, smoking, and anorexia. Provides an historical overview of studies using data from treatment services and institutions as well as field studies of the general population.

**BEH 221c. Mental Health Factors in Organizations and Industry**
Lectures, readings, case illustrations. *One 2-hour session each week. 2.5 units.* Dr. Mertens.
Covers psychological well-being of entire organizations, interpersonal conflict, psychological causes of industrial accidents, industrial and organizational stress, and the organization of psychological units in industry.

*Dr. William McAuliffe, Lecturer on Sociology.*

**BEH 222c. Alcoholism and Alcohol Abuse**
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Wechsler.
Covers the diagnosis, prevalence and etiology of alcoholism and alcohol abuse. Topics include sex and cultural differences, high-risk groups, effects on health, accidental injuries, treatment, prevention, and public policy.

**BEH 223d. Drug Addiction and Drug Abuse**
Seminars, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. McAuliffe.
Covers the prevalence of drug addiction and abuse. Topics include epidemiology, effects on health, etiology, prevention and treatment, and public policy.

**BEH 230c,d. Social and Behavioral Research Methods**
Seminars. *Two ½-hour sessions each week. 5 units.* Dr. Gortmaker.
Covers aspects of behavioral research methods, including research design, measurement, sampling, data collection, and data analysis. By case studies, methodological readings and discussion, students learn the conduct and critical evaluation of experiments, surveys, index construction, longitudinal research, and observational studies.
Prereq. BIO 200a,b or BIO 201a,b.

**BEH 300a,b,c,d,e. Tutorial Programs**
*Time and credit to be arranged.* Members of the Department.
Arrangements may be made with individual instructors to give a reading course on topics not covered in the Department's course offerings.

**BEH 350. Research Training**
Training in research is available through individual arrangements with the members of the Department.

The following courses, offered in the Harvard Graduate School of Education, are among those that may be of particular interest to students of the behavioral sciences. They are open to qualified students from the School of Public Health.

**Human Development, Counseling and Consulting Psychology C-230. Community Psychology**
*Fall term.* Katz.

**Human Development, Counseling and Consulting Psychology C-240. Psychological Healing in Cross-Cultural Perspective**
*Spring term.* Katz.

**BIO 111c,d. Biostatistics for Medical Investigators**
Lectures. *One 1½-hour session each week. 1 unit.* Dr. Gelman.
Topics include: role of randomization, replication and local control; planning of scientific experiments, therapeutic investigations and prognostic factors; concept of a population, mean and variance; confidence procedures for one and two population problems; analysis of proportions; survival data, life tables and maximum likelihood estimates.

**BIO 112a, 112c. Computing Principles and Methods I**
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
Introductory course designed to provide basic computer literacy to students from all disciplines. Topics include: computer terminology; the organization, capabilities and limitations of modern computer systems; data collection methods; programming principles; and the design and analysis of information systems.

**BIO 113b, 113d. Computing Principles and Methods II**
Lectures, discussions. *Two 1-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units.* Members of the Department.
A practical introduction to the principles of programming, using the language BASIC, in order to allow students to utilize personal computers recently acquired by the School. Topics include: information flow; stepwise refinement of algorithms; structured programming techniques; comparison of programming languages; and the use of statistical packages.
Prereq. BIO 200a,b, BIO 201a,b, BIO 112a or equivalent.

**BIO 200a,b. Introduction to Statistical Methods**
Lectures, discussions. *Two 1½-hour sessions each week.*
Laboratory. *One 1-hour session each week. 5 units.* Dr. Harrington.
Basic statistical techniques which are important for analyzing data arising from clinical and laboratory studies. Major topics include: elements of probability, introduction to estimation and inference, distribution free methods, contingency tables, life tables, regression analysis and elements of study design. Applications are stressed. Designed as an alternate to BIO 201a,b, for students desiring more emphasis on theoretical developments or those having had an introductory statistics course at the level of BIO 201a,b. Credit will not be given for both BIO 200a,b and BIO 201a,b.
Prereq. A course in calculus.

**BIO 201a,b. Principles of Biostatistics**
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Drolette.
Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics, their application and interpretation. Topics include: descriptive statistics, probability distributions, inference, tests of significance, association, and regression.
**Note:** This course cannot be counted as part of the credit requirement for a major or minor doctoral field. Credit will not be given for both BIO 200a,b and BIO 201a,b.

**BIO 202c,d. Statistical Methods for Epidemiologic Research**
Lectures. *Two 1½-hour sessions each week.*
Laboratory (optional). *One 2-hour session each week. 5 units.* Dr. Tsiatis.
Emphasizes concepts and methods for quantifying relationships between variables. Stresses issues in nonexperimental research. Topics include: measures of association, confounding and interaction, regression, analysis of covariance, one- and two-way analysis of variance, analysis of two-by-two contingency tables, logistic regression, analysis of matched pairs, analysis of rates, and survival data analysis.
Prereq. BIO 200a,b, BIO 201a,b or equivalent.

**BIO 203c,d. Statistical Methods in Experimental Research**
Lectures. *Two 1½-hour sessions each week. 5 units.* Members of the Department.
Uses extensive examples from laboratory science. Students learn to formulate a scientific question in terms of a statistical model, leading to objective and quantitative answers. Principal topics are analysis of variance and regression, including details of data-analytic technique and implications for experimental design. Also included are probability models and some computing.
Prereq. BIO 200a,b, BIO 201a,b or equivalent.

**BIO 204c,d. Vital and Health Statistics**
Lectures and discussions. *One 2-hour session each week. 2.5 units.* Dr. Drolette.
Discussion of the types, sources, methods of collection, and uses of vital and health statistics for public health purposes. Effective use of existing data will be emphasized, together with consideration of incomplete data and sampling methods for obtaining new information, both nationally and internationally.

**BIO 205c,d. Mathematical Foundations of Biostatistics**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Drolette.
Material includes: mathematical descriptions of commonly used distributions; standard procedures for estimating the moments of a distribution; and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem, power and Bayesian inference.
Prereq. A course in elementary calculus.

**BIO 207c,d. Survey Research Methods in Community Health**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Bailar, Dr. Mangione.
Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional or other types of survey research.

**Topics in Biostatistics (BIO 209a,b and BIO 210d)**
Offered primarily for students majoring in biostatistics or epidemiology, although qualified students from other departments are welcome. The topics covered will vary from year to year, based on recent developments in biostatistics and the research interests of the instructor. Registration requires the permission of the instructor.

**BIO 209a,b. Topics in Applied Time Series Analysis**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Members of the Department.
Designed to introduce students to the practice of time series analysis. Each meeting will consist of a lecture followed by an open discussion of problems and research assignments. Topics include: description of time series, systematic study of problems involving multivariate time series, filters, environmental cycles, Box-Jenkins approach, biological prediction, and environmental forecasting.
Prereq. A course which includes regression analysis or permission of the instructor.
Primary course instructor is Dr. Garsd.

**BIO 210d. Mathematical and Algorithmical Methods in Molecular Biology**
Lectures, discussions. *Two 2-hour sessions and one 1-hour practical each week. 2.5 units.* Members of the Department.
Designed to introduce the students of statistics, medicine, and molecular genetics to the important interrelationship between the research problems in molecular genetics and modern computer/mathematical analysis tools. Acquaints students with the expanding wealth of molecular biology problems now requiring analytical analysis, and with modern computer methods. Subjects include: information theory and statistical analysis of various genetic domains, DNA comparative homology searches and RNA secondary structure predictions using dynamic programming and the employment of hash coding, finite state machines and branch and bound methods. Concentrates on methods currently employed as presented in the recent molecular genetic research literature.
Prereq. At least one of the following: an introductory course in statistics, biochemistry or genetics, or a course in finite mathematics.
Primary course instructor is Dr. Smith.

**BIO 211c,d. Discrete Multivariate Analysis**
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1-hour session each week. 5 units.*
Dr. Laird.
Deals with the use of log linear and logistic models for analyzing counted data. Emphasizes practical application rather than mathematical theory. Extensive use is made of computer packages for data analysis. Topics include: the analysis of contingency tables, chi-square and exact tests, measures of association, logistic regression, log linear analysis using iterative proportional fitting, and the binomial, multinomial and Poisson distributions.
Prereq. BIO 202c,d, BIO 203c,d, or equivalent.

**BIO 214c. Principles of Clinical Trials**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelber.
Designed for individuals interested in the scientific, policy and management aspects of clinical trials. Topics include: types of clinical research, study design, treatment allocation, randomization and stratification, data management and quality control, sample size requirements, patient consent, and interpretation of results. Students will design a clinical investigation in their own field of interest and will critique recently published investigations.
Prereq. Previous or concurrent enrollment in an introductory statistics course.
Required for students in the two-year Health Policy and Management Program Medical/Dental Track.

**BIO 217a,b. Probability Theory and Applications**
Lectures. *Two 1½-hour sessions each week. 5 units.*
Dr. Zelen.
A course in probability theory fundamental to the statistics program. Topics include: algebra of events, axiomatic foundations, combinatorial probability, discrete and continuous sample spaces, Lebesgue integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-related areas.
Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

**BIO 218c,d. Statistical Inference**
Lectures. *Two 1½-hour sessions each week. 5 units.*
Members of the Department.
A fundamental course in statistical inference. Topics include: methods of estimation, least squares, maximum likelihood, Bayesian methods, properties of estimates, confidence procedures, significance testing, likelihood ratio tests, goodness of fit tests, Neyman-Pearson theory, sufficiency, power and optimality, sequential analysis, nonparametric inference, and decision theory. The theory will be illustrated with examples from health-related research.
Prereq. BIO 217a,b or equivalent.

**HPM-BIO 219b, 219c, 219d. Statistical Methods for Health Policy and Management**
Lectures. *Three 2-hour sessions each week, 2.5 units each period.*
Dr. Anderson, Dr. Lavin.
(Course described under Health Policy and Management.)

**BIO 220c,d. Multivariate Analysis for Quantitative Data**
To be given 1985-86; offered alternate years.
Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Ware.
An introduction to the fundamentals of multivariate analysis and the analysis of serial measurements. Topics include: the multivariate normal distribution, estimation of the mean and covariance matrix, Hotellings $T^2$, principal components, factor analysis, random effects and mixed models, and variance components. Classical methods for the analysis of repeated measures and longitudinal data reviewed and newer methodology based on random effects and time series formulations presented. Computational issues discussed for both traditional and new methodologies.
Prereq. At least one statistics course beyond the level of BIO 202c,d. Knowledge of matrices and some familiarity with computer packages such as SPSS, BMD or SAS.

**BIO 235c,d. Mathematical Models in Biology**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Feldman, Dr. Awerbuch.
Mathematical models as a basis for analyzing biological phenomena. An intermediate level course for students in laboratory science and biostatistics. Applied topics include: carcinogenesis, compartmental distribution of drugs and toxic substances, molecular binding, diffusion bioassay, membrane transport, cell and enzyme kinetics, physiologic scaling. Methodological topics include curve-fitting, experimental design, computer simulation.
Prereq. Introductory calculus; BIO 202c,d or BIO 203c,d (may be concurrent).

**BIO 240c,d. Design of Scientific Investigations**
Not given 1985-86; offered alternate years.
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen, Dr. Laird.
Discusses those aspects of statistical theory and practice relative to the design of scientific investigations in the health sciences. Topics include: planning of sample surveys; basic principles of experimental design: randomization, replication and balance; randomization related to distribution-free methods; fixed, mixed and random models; experimental designs and techniques for reducing variability; block designs and analysis of covariance; human studies; multicenter longitudinal follow-up and observational studies; sequential studies; adaptive and allocation rules; special features with discrete response data.
Pre- or co-req. BIO 263a,b or permission of the instructor.

**BIO 251a,b. Data Analysis**
To be given 1985-86; offered alternate years.
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Louis.
Surveys methods of exploratory data analysis, modern non-parametrics, sample reuse and empirical Bayes. Topics include robust and resistant fitting techniques, regression diagnostics, non-parametric regression, and cross-validation. Jack-knife and bootstrap sample reuse plans are introduced. Underlying concepts, interpretations and practical experience are stressed.
Prereq. BIO 202c,d, BIO 203c,d or equivalent.

**BIO 261a,b. Theory of Biometry I**
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Lagakos.
Discusses the theoretical basis of concepts and methodologies associated with survival data and censoring, nonparametric tests, competing risk models, carcinogenicity testing, and low dose extrapolation. Material is drawn from recent literature.
Prereq. BIO 211c,d or equivalent or permission of the instructor.

**BIO 262c,d. Theory of Biometry II**
Not given 1985-86; offered alternate years.
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Members of the Department.
A continuation of BIO 261a,b. Topics include: semi-Markov processes as models for disease processes, models of early disease detection, length-biased sampling, optimization and periodic screening, and methods for combining evidence from different experiments.
Prereq. BIO 261a,b.

**BIO 263a,b. Regression and ANOVA**
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Gray.
Examines the methods of least squares and maximum likelihood as applied to linear statistical models: multivariate regression, calibration, analysis of variance, and random effects models. Topics include: the development of hypothesis testing, confidence intervals and Bayesian techniques. Exercises and examples emphasize medical applications.
Prereq. BIO 218c,d, or equivalent; familiarity with matrix algebra.

**BIO 273a,b. Introduction to Computing**
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Pagano.
Introduces the fundamentals of computing, emphasizing algorithms, information flow and the systematic design of programs in higher-level languages such as C. Topics include: the structure of digital computers, programming languages, algorithm development and usage, systems of analysis, and systematic design of programs and computing systems.

**BIO 274c,d. Statistical Computing**
Not given 1985-86; offered alternate years.
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.*
Dr. Pagano.
Enables students to understand, properly use and possibly develop statistical algorithms or software. Topics are prompted by statistical procedures or biomedical applications and include: computer arithmetic, error analysis, numerical techniques, equation solving, matrix operations, approximation and smoothing, optimization, and simulation modeling.
Prereq. BIO 273a,b or equivalent or permission of the instructor.

**BIO 275c,d. Applied Data Management**
Not given 1985-86; offered alternate years.
Lectures, demonstrations. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.*
Members of the Department.
Introduces management of data, both external and internal to computer data bases, concepts and techniques for handling data before it is ready for analysis, and practical aspects of computer data base design and usage. Topics include: data collection, forms and coding, data entry systems, quality control, data base structures (both logical and physical), data base management systems, file organization, and data models.
Prereq. BIO 273a,b or equivalent or permission of the instructor.

**BIO 276a,b. Principles of Systems**
Lectures. *Two 1½-hour sessions each week. 5 units.*
Dr. Pagano, Dr. Hunt.
Intermediate-level course designed to provide a technical background in operating systems and associated systems programs. Process scheduling and control, resource management, loader functions, assemblers and compilers studied in detail.
Prereq. BIO 273a,b or equivalent.

**BIO 277c,d. Computing Applications in the Biomedical Sciences**
Lectures. *Two 1½-hour sessions each week. 5 units.*
Dr. Pagano.
Intermediate-level course designed to provide a technical overview of the application of computers to the biomedical sciences. Topics include: computerized medical record systems, diagnostic and therapy support systems, patient monitoring, clinical laboratory systems, occupational health systems, and medical imaging.
Prereq. BIO 113b or BIO 273a,b or equivalent.

**HPM-BIO 280c. Decision Analysis for Health and Medical Practices** (Public Policy S-176m)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
(Course described under Health Policy and Management.)

**HPM-BIO 281d. Seminar on Clinical Decision Analysis**
Seminar. *Two 2-hour sessions each week. 2.5 units.*
Dr. Fineberg, Dr. Barnes, Dr. Weinstein.
(Course described under Health Policy and Management.)

**BIO-HPM 284a,b. Topics in Decision Theory**
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Members of the Department.
Presents selected topics in the theory and methods that underlie decision and risk analysis, including axiomatic foundations of expected utility theory; statistical decision theory; relation between decision theory and classical inference; ROC analysis and diagnostic technology assessment; Markov decision models; dynamic programming; multiattribute utility theory; computing for decision analysis.
Prereq. HPM 280c, HPM 279c or equivalent; at least one semester of biostatistics beyond the introductory level; knowledge of elementary calculus and matrix algebra. Permission of the instructor required.

**BIO-HPM 285a,b. Health Risk Assessment and Appraisal**
Lectures. *One 2-hour session each week. 2.5 units.*
Dr. Bailar.
Identification of hazards to health, dose-response relationships, exposure assessment, and their integration to an overall quantitative risk assessment. Special attention to environmental hazards that are ill-defined or hard to measure; heterogeneity in sensitivity; conflicting data; and non-random errors. Focus throughout is on risk assessment for use in setting policy.
Prereq. BIO 200a,b, BIO 201a,b or equivalent.

**BIO 310-315a,b,c,d. Tutorial Programs**
*Time and credit to be arranged.* Members of the Department.
An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Statistical Methods*
Guided study in specific areas of statistical methodology and application, including participation in the Departmental Journal Club.

311 *Teaching*
Work with the Department in laboratory instruction and the development of teaching materials.

312 *Consultation*
Work with members of the Department on current statistical consultation activities.

313 *Computing*
Guided study in scientific programming, numerical methods and data management.

314 *Study Design*
Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Data Analysis*
Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of 5 credit units in the summer term.

**BIO 350. Research**
Candidates for the Doctor of Public Health, Doctor of Science or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

**CB 202b. Critiques of Current Literature in Virology and Immunology**
Seminars. *One 2-hour session each week. 1 unit.* Members of the Department.
Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation. The course will not be given if less than eight students enroll.

**CB 204a,b. Immunobiology**
Lectures. *One 1-hour session each week. 2.5 units.* Dr. Glimcher, Faculty and Guest Lecturers.
The anatomy and physiology of the immune system, fate of antigen, cell trafficking, cellular interactions, and regulation of the immune response, B and T cell recognition mechanisms. Principles of immunoregulation will be discussed in the context of current literature. Grade will be based on class participation and a paper. Students must have basic courses in microbiology and immunology and approval of the instructor.

**CB 205a,b/205c,d. Departmental Seminar**
Seminars. *One 1-hour session each week. 1.25 units each term.* Dr. Eisenstadt, Dr. Mullins, Members of the Department.
Students and faculty will present research seminars and current literature reviews. Topics include: chemical and viral carcinogenesis, DNA damage and repair, immunology, molecular biology, radiobiology, and virology.
Enrollment required for all doctoral students in Cancer Biology.

**CB 207c,d. Radiation Biology**
To be given 1985-86; offered alternate years.
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.
This course is divided into two parts: cellular and mammalian radiobiology. The first includes radiation chemistry, cell survival, transformation and mutagenesis, cytogenic effects, UV-photobiology, and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome and the human epidemiologic data for radiation carcinogenesis are emphasized.
Prereq. ESP 205a,b or college-level course in biology.

**CB 212a,b. Introduction to Cancer Biology**
To be given 1985-86; offered alternate years.
Lectures and discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Kennedy, Dr. Eisenstadt, Dr. Cairns, Guest Lecturers.
Emphasizes current experimental approaches to studying cancer biology and the process of carcinogenesis. Topics include: the biology of cell modification and differentiation, the phenotype of the cancer cell, the properties of human and animal cancers, the process of cell transformation, mutagenesis, carcinogen metabolism and the general features of cancer epidemiology, and what these say about the causes of human cancer. Early in the course, several introductory lectures will be given to cover basic concepts of genetics, cell biology and molecular biology.
A background in some branch of science is desirable.

**CB 217a,b. Human and Animal Virology**
To be given 1985-86; offered alternate years.
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Essex, Dr. Mullins.
Provides students with fundamentals of medical virology and introduces the new and relevant concepts emanating from recent and ongoing research. Topics include: virus-host cell interaction, molecular aspects of virus replication and pathogenesis, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, molecular and virological techniques, and community control measures. Selected virus groups discussed in detail. Suggest students discuss enrollment with instructor before registering. The course will not be given if less than eight students enroll.

**CB 219c,d. Advanced Cancer Cell Biology**
(Biophysics 203)
Lectures. *One 2-hour session each week. 5 units.* Dr. Haseltine, Dr. Chen (Associate Professor of Pathology, Harvard Medical School).
This is an advanced-level course for those planning to do research in the areas of carcinogenesis, tumor cell biology and cancer pharmacology. Examines the nature of cancer at the molecular level. Explores the differences between normal cells and tumor cells in animals and in tissue culture. Draws upon cell biology, viral oncology, tumor immunology, and genetics. Specific topics include: viral and chemical carcinogenesis, genetics of cancer and the transformed state, the nature of virus coded transformation functions, exogenous control of cell growth, the cell surface

of normal and transformed cells, cell structure and mobility, the differences between benign and malignant tumors, the problem of metastasis, and mutation and differentiation as models for cancer.
Suggested prereq. Cell Biology 202, The Biology of the Cancer Cell, Biochemistry 165, Oncogenic Viruses, CB 217b or equivalent.

**CB 300a,b,c,d. Tutorial Programs**
*Time and credit to be arranged.* Members of the Department.
Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 *Viruses*
Dr. Essex, Dr. Haseltine, Dr. Mullins.
Isolation and identification of representative viruses by use of cell culture, animal inoculation and serologic and molecular biological techniques.

303 *Immunochemical Methods*
Dr. Essex, Members of the Department.
Methodology of immunofluorescence, enzyme-linked immunoassays, 51 Cr-release, chromatography, immunoelectrophoresis, monoclonal antibodies as applied to oncogenesis, and resistance to infectious viral agents.

304 *Public Health Laboratory*
Associates at the State Laboratory Institute.
The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation and testing of new and standard serums, vaccines and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 *Tumor Biology*
Members of the Department.
Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological and diagnostic investigations of various tumor systems of known and unknown causes discussed. The relationship between the immune response and the oncogenic process examined.

306 *Cellular Immunology and Molecular Biology of the Immune System*
Dr. Glimcher.
Examines the events following immunization of infection where the quality and quantity of the immune response is regulated by subsets or lymphocytes and their products. The mechanism of this regulation is explored by analyzing immunologic circuits, idiotypic recognition and antibody and cell mediated cytotoxicity.

307 *Radiobiology*
Dr. Little, Dr. Kennedy.
Current topics in Radiobiology at molecular, cellular and organismal levels. Cytotoxic, mutagenic and carcinogenic consequences of ionizing and nonionizing radiations are examined, with emphasis on genetic, physiologic and environmental factors that modify these biologic effects.

308 *Chemical Carcinogenesis*
Dr. Cairns, Dr. Eisenstadt, Dr. Haseltine.
Methodology and interpretation of tests for chemical carcinogens, mutagenesis and repair of DNA, and the time course of the formation of cancer.

**CB 350. Research**
Qualified doctoral candidates, research Fellows and full-time special students may register for CB 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the Department are indicated under CB 300. Inquiries about specific research opportunities should be addressed to the Chairman of the Department.

**ESP 201a, 201c. Principles of Environmental Health I**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a first step in a review of the more important environmental health problems facing society. Topics include: environmental physiology, radiation protection, community air pollution, occupational health, and municipal water purification and wastewater treatment. Students will be required to develop and submit plans for a term paper.
**Note:** Students in the M.P.H. program are required to take this course, plus either ESP 202b or 203d. For convenience in scheduling, ESP 201 is offered in both the "a" and "c" periods.

**ESP 202b. Principles of Environmental Health II**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a continuation in the review of the more important environmental health problems facing society. Topics include: energy and the environment, environmental toxicology and hazardous waste management, environmental law and economics, accidents and public health, insect and rodent control, and environmental monitoring. Submission of a completed term paper is required.
**Note:** Students in the M.P.H. program are required to take either this course or ESP 203d, plus ESP 201. Enrollment in ESP 202b is recommended for students specializing in one or more of the programs of the Department of Environmental Science and Physiology.

**ESP 203d. Principles of Environmental Health III**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Emphasizes environmental health problems in the less-developed countries. Topics include: individual household water supplies and wastewater treatment; basic sanitation; insect and rodent control; nutrition and foodborne diseases; housing and home accidents; operation, maintenance and management of environmental systems; environmental manpower and training; and the selection of appropriate technology for coping with such problems. Submission of a completed term paper is required.
**Note:** Students in the M.P.H. program are required to take either this course or ESP 202b, plus ESP 201. Because of the special orientation of the subject matter presented, it is suggested that students interested in environmental health problems in the less-developed countries enroll in ESP 203d. Students interested in the subject matter in this course, as well as that presented in ESP 202b, may take both courses, as well as ESP 201, and receive credit for all three courses (7.5 units).

**ESP 204c,d. Environmental Health Evaluation and Management**
Seminars, lectures. *Two 1½-hour sessions each week; additional computational sessions to be arranged. 5 units.* Dr. Harrington.
Introduces concepts and analytical methods for the quantitative evaluation and management of man's environment. Topics include: the development of natural resources, resulting environmental conditions and effects on human health. Where appropriate, mathematical models are developed and critiqued in a systems-analysis framework. Students are required to submit a term project.
A strong background in college-level mathematics is assumed.

**ESP 205a,b. Human Physiology**
Lectures, conferences, demonstrations. *Two 1-hour and one 2-hour sessions each week. 5 units.* Dr. Loring, Dr. Banzett, Members of the Department.
Students lacking a background in biology are offered an intensive introduction to biological principles and to the physiology of cells, organ systems and organisms. Some pathophysiology and a number of laboratory exercises are included.
Students without college courses in physics, chemistry and mathematics should speak with the instructor beforehand.

**ESP 206d. The Technology of Hazardous Waste Management**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. First, Dr. Harrington, Dr. Spengler, Guest Lecturers.
Stresses the quantitative aspects of waste interactions with soil, water and air, and their intermedia transport, as the basis for a critical exam-

ination of federal and state laws governing transportation, treatment and disposal of hazardous wastes. Emphasizes protective measures for hazardous waste workers and the avoidance of environmental contamination through uncontrolled release and dispersion.

**EPI-ESP 215c,d. Case Studies in Environmental and Occupational Epidemiology**
Lectures, Seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Robins.
(Course described under Epidemiology.)

**ESP 221c,d. Pulmonary Cell Biology**
To be given 1985-86; offered alternate years.
Lectures. *One 2-hour session each week.*
Laboratory/review sessions. *To be arranged. 5 units.* Dr. Valberg, Members of the Department, Guest Lecturers.
Provides an overview of cell biology as it relates to the structure and function of the cell types found in the respiratory system. Specialization in the plasma membrane, cytoplasmic filaments, macromolecules, secretory products, and organelles will be related to the tasks the cells perform. Particular consideration will be given to how cell and tissue functions are integrated to provide for both efficient gas exchange and for defense against inhaled particles and pathogens. The relationship of cell biology to current research on inhalation toxicology and pulmonary disease will be explored, and students will become familiar with the techniques of molecular biology.
Prereq. College-level course in one or more of the following topics, otherwise permission of the instructor: Physiology, histology, cell biology or biochemistry.

**ESP 222c,d. Structure and Function of the Mammalian Respiratory System**
Not given 1985-86; offered alternate years.
Lectures. *One 3-hour session each week.*
Demonstrations, discussions. *To be arranged. 5 units.* Dr. Brain, Dr. Leith, Dr. Mead, Dr. McMahon (Professor of Biology, Division of Applied Sciences), Dr. Taylor (Professor of Biology, Faculty of Arts and Sciences).
An introduction to the structure and morphometry of the respiratory system of mammals (from lung to mitochondria), integrating structural and morphometric information with physiological data. Requirements include lectures, demonstrations, discussions, term paper, and oral presentations.
Prereq. College-level course in histology or cell biology.

**ESP 231c,d. Policy Issues in Occupational Health**
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Monson, Dr. Boden, Dr. Levenstein, Mr. Barmack.
Examines the legal, economic and political foundations of occupational health activities in the United States. Discusses the roles of government, unions, corporations, and research organizations. Helps students acquire an understanding of management functions in corporations. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene and statistical skills to achieve a healthful workplace.

**ESP 232c,d. Introduction to Occupational Medicine**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Greaves.
Reviews the diagnosis and management of occupational diseases following exposure to specific workplace substances, including asbestos, lead, organic solvents, and other substances. Methods of diagnosis of early organ system effects of chemicals and techniques for assessing disability are considered. The course is limited to physicians or others with adequate training by permission of the instructor.

**ESP 233c. Industrial Toxicology**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Greaves, Members of the Department, Guest Lecturers.
Provides detailed information on organ system effects of exposure to workplace chemicals, with emphasis on understanding the pathogenesis of toxin-induced disease and on developing programs for early detection of such conditions. Pulmonary effects receive particular attention. In the second half of the course, effects of exposure to common workplace toxins (e.g., asbestos, lead, solvents, pesticides, other metals, allergens) are discussed.
Prereq. TOX 204a and ESP 251a.
No credit is given for ESP 233 until successful completion of TOX 204a.

**ESP 234d. Basic Problems in Occupational Health**
Lectures. *One 2-hour and one 3-hour session each week. 2.5 units.* Dr. Ferris, Dr. Greaves, Prof. Burgess, Members of the Department.
This problem-solving course uses case studies and walk-through field trips to local industries. Emphasis is on the relation of working conditions to health, with special reference to the rec-

ognition, measurement and control of industrial hazards.
Prereq. ESP 251a.

**ESP-EPI 235a,b. Critical Review of the Scientific Basis for Occupational Standards**
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Robins, Dr. Eisen, Dr. Monson.
Provides students with the opportunity to review the scientific basis for the association of selected occupational exposures with disease. Special emphasis is placed on critical evaluations of the literature. Reviews occupational cancer and respiratory disease, pathophysiology of respiratory disease and epidemiologic approaches to chemical carcinogenesis. Attention is directed specifically to the interface of science and regulatory standards.
Enrollment limited to 15.
Prereq. EPI 201a or EPI 221a, BIO 200a,b or BIO 201a,b, ESP 234d or permission of the instructors. EPI 212d is recommended.

**ESP 236c,d. Advanced Methods in the Analysis of Environmental Health Data**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Robins.
Addresses issues in the analysis of environmental health data and the implications for standard setting. Topics include the modeling of latency, interactions and the healthy worker effect in mortality studies; the fitting of cancer models (e.g., multistage) to data; the consequences of misclassification of non-categorical exposures; and the analysis of pulmonary function data (e.g., horse-racing effect, regression to the mean).

**ESP 241c,d. Occupational Safety**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Snook, Dr. Mangone.
Covers the principles of occupational safety. Topics include: growth of the field of occupational safety; safety regulation and standards; theoretical models of accident causation, accident investigation procedures; and engineering, behavioral and administrative techniques for accident control. Builds toward the development and validation of prescriptive systems for the alleviation of workplace hazards.

**ESP 242c. Occupational Biomechanics and Work Physiology**
Lectures. *Two 1-hour sessions each week.*
Laboratory. *Three 2-hour sessions during course. 1.25 units.* Dr. Snook, Dr. Ciriello.
Presents principles and occupational applications of biomechanics and exercise physiology. Topics include: muscle anatomy and physiology, musculoskeletal mechanics, etiology of occupational musculoskeletal injuries and disorders, energy requirements of work, and systemic responses to work. Emphasizes the use of biomechanical and metabolic models to evaluate occupational stresses and establish safe work practices.
Enrollment limited to 30. Preference given to students in the Occupational Health Program (required for students in Industrial Hygiene/Safety).
Prereq. ESP 205a,b or equivalent.

**ESP 243a,b. Ergonomics/Human Factors**
Lectures, demonstrations. *One 2-hour session each week. 2.5 units.* Dr. Snook.
Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand disorders, slips and falls, human error, and psychological stress. The physiological, psychological and anatomical characteristics of the worker are considered in the development of good job design principles.

**ESP 251a. Health Hazards of Manufacturing Processes**
Lectures, field trips. *One 2-hour and one 3-hour session each week. 2.5 units.* Prof. Burgess, Members of the Department.
Deals with the recognition of health hazards in the workplace and the atmospheric environment, using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace and atmospheric environment.
Enrollment limited to 30 and subject to approval of the instructor. Preference given to students in the Department of Environmental Science and Physiology.

**ESP 252b. Introduction to Industrial Hygiene**
Lectures, seminars, laboratories. *Two 2-hour sessions each week. 2.5 units.* Dr. Ellenbecker, Prof. Burgess.
Intended for physicians, nurses and other health professionals who will work with industrial hygienists in a variety of settings. Designed to familiarize these professionals with the methods used by the industrial hygienist in the prevention of occupational disease, thereby promoting a more effective working relationship. Topics include: the physical form of air contaminants, air sampling and analysis, engineering controls, and the preparation of survey protocols.

**ESP 253c. Environmental Control** (ENG SCI 270)
Lectures. *One 2-hour session each week.*
Laboratory. *One 3-hour session each week. 5 units.*

Dr. Ellenbecker, Prof. Burgess, Dr. Cudworth, Mr. Cavanaugh (Consultant in Acoustics).
Covers: 1) the design and evaluation of local and general exhaust ventilation systems for the control of toxic air contaminants; 2) control of heat stress in industry; 3) respiratory protection equipment; 4) the fundamentals of sound and vibration generation, transmission and reception; and 5) noise control fundamentals. These topics are explored by means of lecture, laboratories, and field trips to industrial plants.
Required for concentrators in industrial hygiene and air pollution control.

**ESP 261a,b. Properties of Airborne Contaminants** (ENG SCI 276)
Lectures. *Two 1-hour sessions each week.*
Laboratories. *One 2-hour session each week, "a" period; one 4-hour session each week, "b" period. 5 units.* Dr. Ellenbecker.
Covers the properties of airborne contaminants (aerosols, gases, vapors) and the physical principles underlying their behavior. Topics include: particle motion due to gravitational, thermal, and electrostatic forces; diffusion; particle impaction; filtration; and physical properties of gases and vapors. Laboratories cover optical and electron microscopy, sampling, measuring concentrations, and particle size measurement.
Required for concentrators in industrial hygiene and air pollution control.

**ESP 262c,d. Assessment and Evaluaton of Environmental Exposure**
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Evans, Dr. Spengler, Dr. Harrington.
Covers principles of exposure assessment; introduces basic methods for monitoring and modelling ambient concentrations; examines relationships between concentration, exposure and dose; discusses risk assessment and its relationship to exposure evaluation. Required for concentrators in air pollution, environmental management, industrial hygiene, and/or radiation protection.
Prereq. Calculus and ESP 261a,b or permission of the instructor.

**ESP 263c,d. Air and Gas Cleaning** (ENG SCI 279)
To be given 1985-86; offered alternate years.
Lectures. *One 2-hour session each week.*
Laboratory. *One 4-hour session each week. 5 units.* Dr. Ellenbecker, Members of the Department.
Theory, selection, application, and testing of gas-cleaning devices. Particle collection by inertial, centrifugal, electrostatic, and other forces; gas absorption in liquids, adsorption on solids and incineration. Laboratory experiments illustrate principles involved.
Required for concentrators in air pollution control and industrial hygiene.
Prereq. ESP 261a,b.

**ESP 264a,b. Analytic Chemistry for Environmental Assessment**
Not given 1985-86; offered alternate years.
Lectures. *One 2-hour session each week.*
Laboratory. *One 4-hour session each week. 5 units.* Members of the Department.
Introduces analytic and instrumental methods frequently used in evaluation of environmental samples; atomic absorption spectrophotometry; gas and liquid chromatrography; mass spectrometry; electrochemical methods; neutron activation analysis; x-ray fluorescence; x-ray diffraction; and photochemical methods. Student projects are required.
Required for concentrators in air pollution, environmental management and industrial hygiene.
Prereq. Permission of the instructor.

**ESP 265d. Community Air Pollution** (ENG SCI 274)
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler, Dr. First.
Covers air quality standards; health effects; damage to animals, plants and property; community and site surveys; the legal and enforcement aspects of air pollution control.
Prereq. ESP 251a, ESP 264a,b, ESP 262c,d (may be taken concurrently) or permission of the instructors.

**ESP 266c,d. Advanced Topics in Aerosol Science**
Not given 1985-86; offered alternate years.
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Ellenbecker.
Covers aspects of aerosol science not covered in ESP 261a,b, including coagulation, condensation and evaporation, optical properties, electrical properties and production of test aerosols.
Prereq. ESP 261a,b.

**ESP 270a. Basic Radiation Protection** (One half of ENG SCI 278)
Lectures, demonstrations. *Two 2-hour sessions each week. 2.5 units.* Dr. Shapiro, Dr. Moeller.
Covers principles of radiation protection; interaction of ionizing particles with matter; the concept of radiation dose from external and internal sources; dose calculations; and radiation measurements.

**ESP 271b. Occupational and Environmental Radiation Protection** (One half of ENG SCI 278)
Lectures, demonstrations. *Two 2-hour sessions each week. 2.5 units.* Dr. Shapiro, Dr. Moeller.
Covers biological effects of radiation; radiation epidemiology; radiation protection standards and regulations; laboratory, industrial and environmental sources of radiation; and methods of environmental and occupational radiation protection.
Prereq. ESP 270a or equivalent.

**ESP 273c,d. Concepts and Issues in Radiation Protection**
Not given 1985-86; offered alternate years.
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Moeller, Dr. Shapiro.
Involves detailed study of current handbooks and publications related to radiation protection. Areas covered include the regulation of radiation use and the evaluation and control of radiation hazards. Specific topics include: regulatory guides and standards, safety evaluation reports, evaluation of operating experience, risk assessment, and emergency planning. A term report is required.
Ten or more students must be enrolled for course to be offered.
Prereq. ESP 270a or ESP 271b and permission of the instructors.

**HPM-ESP 277c. Environmental Health Policy Analysis**
Lectures, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas, Dr. Roberts, Dr. Evans.
(Course described under Health Policy and Management.)

**ESP-HPM 278a,b. Operations Management**
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Evans, Dr. Shepard.
Introduces quantitative techniques useful for making models and decisions in the areas of environmental and health services. Topics include: linear programming, statistical decision analysis, modeling, simulation queuing, and analysis of error propagation. Uses micro (personal) computers.
Prereq. Calculus and statistics or permission of instructor.

**ESP 300a,b,c,d. Tutorial Programs**
*Time and credit to be arranged.*
Opportunities are provided for individual tutorial work for qualified students in the fields of respiratory biology, respiratory epidemiology, occupational medicine, industrial hygiene and ventilation, aerosol technology, radiological health, medical radiation physics, nuclear medicine, solid waste management, air pollution control, and environmental health management.

**ESP 330e. Field Work**
*One-week period between fall and spring terms. 1 unit.*
A week of supervised field observation is offered to students who may choose appropriate visits to medical or industrial hygiene departments of industries, airports and other agencies which have operations or research in the field of environmental health. Field work arrangements are generally made early in the fall term.

**ESP 350. Research**
Doctoral students may undertake theoretical, laboratory or field research under the direction of faculty members working in the following areas:

*Air Pollution*
Dr. First, Dr. Spengler.
Industrial gas cleaning, personal exposure monitoring, assessing air pollution potential from simple and complex pollution sources.

*Community Air Pollution*
Dr. Ferris, Dr. Speizer.
Health effects of air contaminants, epidemiology.

*Environmental Health Management*
Dr. Moeller, Dr. Hornig, Dr. Harrington, Dr. Evans.
Quantitative methods of environmental management, risk analysis, environmental standards, and criteria.

*Industrial Hygiene*
Prof. Burgess, Dr. Ellenbecker.
Monitoring exposures of occupational groups to toxic air contaminants, aerosol, physics, and ventilation; ergonomics applications to job design.

*Inhalation Toxicology*
Dr. Brain, Dr. Valberg.
Biological responses to inhaled particles and gases, deposition and clearance mechanisms.

*Mathematical Physiology*
Dr. Feldman, Dr. Butler.
Modeling of organ systems, experimental design.

*Occupational Health*
Dr. Monson, Dr. Greaves, Dr. Robins.
Epidemiological and field studies, health hazard evaluation.

*Radiological Health*
Dr. Moeller, Dr. Shapiro.
Reduction of dose from sources of natural origin, radiation safety criteria and standards, control of radioactive contamination.

*Respiratory Mechanics*
Dr. Mead, Dr. Banzett, Dr. Loring, Dr. Drazen.
Physiological measurement of respiratory function.

*Solid Wastes*
Dr. First.
Incineration of solid wastes, including municipal, radioactive, biological, and laboratory materials.

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The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

**Economics 1551. The Political Economy of Environmental Quality**
Half course *(spring term). Tu., Th., at 12.*
Dorfman.
Prereq. Social Analysis 10 or permission of instructor.

**Biology 150. Introduction to Microbial Ecology**
Half course *(fall term). M., W., F., at 11.*

**Engineering Sciences 162. Hydrologic Cycles**
Half course *(fall term). Tu., Th., 10-11:30.*
Fiering.
Prereq. Applied Mathematics 21b and one year of college-level physics.

**Engineering Sciences 260. Engineering Systems for Environmental Control**
Not given 1985-86; offered alternate years.
Half course *(spring term). M., W., F., at 10.*
Harrington.
Prereq. Engineering Sciences 123 or permission of instructor.

**Engineering Sciences 264. Chemical Aspects of Natural and Polluted Waters**
Half course *(spring term). Tu., Th., 1-2:30.* Butler.
Prereq. Physical chemistry (e.g., Chemistry 10 or Engineering Sciences 161), and some experience with biology and geology.

**M-113. Analytic Frameworks for Policy**
Half course *(fall term). M., W., 9:30-11:00.* Zeckhauser.
Prereq. Microeconomic theory, optimization and decision analysis.

**S-114m. Issues in Hazardous Waste Management**
Modular course *(spring term). Hours to be arranged.* O'Hare.

**M.I.T. 1.143J. Mathematical Optimization Techniques**
Nine units *(fall term). Hours to be arranged.* D. H. Marks, H.N. Psaraftis.

**M.I.T. 1.811J. Environmental Law: Pollution Control**
Nine units *(fall term).* Ashford, Heaton.

**M.I.T. 1.812J. Regulation of Chemical Toxins, Radiation and Biotechnology**
Nine units *(spring term).* Ashford, Caldart, Hattis.

**M.I.T. 1.83. Organic Compounds in Aquatic Environments**
Nine units *(fall term).* Gschwend.

**M.I.T. 10.805J. Technology, Law and the Working Environment**
Nine units *(fall term).* Ashford, Caldart.

**M.I.T. 15.065. Decision Analysis**
Nine units *(fall and spring terms). Hours to be arranged.* Kaufman.

**M.I.T. 15.074. Mathematical Models and Policy Analysis**
Nine units *(spring term). Tu., Th., 1-2:30.* Barnett.
Prereq. Statistics.

**Note:** Either EPI 201a or EPI 221a satisfies the requirement of an introductory course in epidemiology. However, individual programs may require one or the other.

**EPI 201a. Introduction to Epidemiology**
Lectures and seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. Gutensohn, Members of the Department.
Introduces the basic principles and methods of epidemiology. Lectures are complemented by seminars devoted to exercises or to the discussion of current examples of epidemiologic studies. This course leads into EPI 202b and is recommended for all students who wish to take more than the minimum School requirement. Credit cannot be received for both this course and EPI 221a.

**EPI 202b. Epidemiologic Reasoning and Practice**
Lectures, seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. Maclure.
Presents the principles of problem conceptualization, study design, analysis and inference, and emphasizes learning theoretical issues through practical exercises. Serves as an introduction to more advanced study or as a final course for students at the master's level desiring a working familiarity with epidemiologic methods.
Prereq. EPI 201a or, with permission of the instructor, EPI 221A.

**EPI 205c,d. Practice of Epidemiology**
Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Willett, Dr. Hutchison, Dr. MacMahon.
The seminars consist of student presentations of plans for collection and analysis of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. The emphasis will be on conceptual issues and not on execution.
Prereq. EPI 202b and permission of the instructor. Enrollment limited to 16 students.

**EPI 206d. Methods in Descriptive Epidemiology**
Lectures. *Two 1-hour sessions each week. 1.25 units.* Dr. Boyle.
Presents techniques to analyze and interpret data relating to descriptive epidemiology, particularly of chronic disease. Data sources are critically reviewed and techniques to compare disease levels are presented. Methods are also outlined to analyze temporal trends, to isolate mechanisms (such as cohort effects) underlying such trends, to investigate epidemicity, to map chronic disease, and to measure spatial aggregation of population sub-divisions with similar disease levels.
Prereq. EPI 201a or EPI 221a (with permission of the instructor), BIO 200a,b or BIO 201a,b or equivalent.

**EPI 207c. Cohort Studies**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.*
Dr. Walker.
Examines common problems in the design, analysis and interpretation of cohort studies. Problems of exposure and disease definition, time dependent effects, confounding and misclassification are considered in the light of data sources typically available. Relevant statistical methods are introduced but developed in detail only insofar as they affect study design.
Prereq. EPI 202b, BIO 211c,d (may be taken concurrently) and permission of the instructor.

**EPI 208d. Case-Control Studies**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker.
Extends the discussions initiated in EPI 207c to studies in which information on the population at risk is derived from sample-based data. Implications of case and control selection procedures are discussed in detail, as are the application in case control studies of the concepts and analytic procedures developed for cohort studies.
Prereq. EPI 207c, BIO 211c,d (may be taken concurrently) and permission of the instructor.

**EPI 209a,b. Issues in Epidemiologic Methodology**
Student presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. MacMahon, Guest Faculty.
Offers doctoral students in epidemiology an opportunity to review one methodologic problem in depth and to become acquainted with seven other topics. Faculty response follows each didactic student presentation. Doctoral students in biostatistics may enroll if space allows.
Prereq. Epidemiologic and statistical background equivalent to a one-year S.M. in epidemiology and permission of the instructor.

**EPI 210b. Epidemiology of Mental Disorders I 1.25**
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Klerman, Dr. Mollica, Dr. Murphy.

Surveys current trends in psychiatric epidemiology. Emphasis is on the development of standardized methods of case diagnosis and application to the epidemiologic study of specific mental disorders.
Prereq. EPI 201a or equivalent.

**EPI 211c. Epidemiology of Mental Disorders II**
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Klerman, Dr. Mollica, Dr. Murphy.
Emphasizes affective disorders, schizophrenia and depression. Special attention focuses on sex differences, social class, risk factors, family studies and genetics.
Prereq. EPI 210b.

**EPI 212d. Epidemiology of Cardiovascular and Respiratory Disease**
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Hutchison.
Reviews the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

**EPI 213c. Epidemiology of Cancer**
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Gutensohn.
Reviews basic concepts and issues central to cancer epidemiology. Considers the descriptive epidemiology of cancer and discusses the implications of the biology of cancer for identification of risk factors. Examines the role of smoking, radiation, hormones, nutrition, and viruses. Each student prepares a review of the epidemiology of a specific cancer site.
Prereq. EPI 201a.

**EPI-ESP 215c,d. Case Studies in Environmental and Occupational Epidemiology**
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Robins.
This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature and presentations by outside experts on the evaluation and impact of epidemiologic data.
Prereq. EPI 201a and BIO 200a,b, or BIO 201a,b.

**NUT-EPI 216a,b. Nutritional Epidemiology**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi.
(Course described under Nutrition.)

**EPI 217d. Assessment Methods in Psychiatric Epidemiology**
Seminars. *One 2-hour session each week.* Practicum. *2-4 hours each week. 2.5 units.* Dr. Klerman, Dr. Murphy.
Focuses on recent advances in the assessment of psychopathology. Students are provided with information and principles for selecting appropriate assessment techniques for studies of general populations as well as studies of psychiatric patients. The students also gain video exposure and/or practical experience in the administration and analysis of four widely used instruments. A weekly practicum of 2-4 hours of interviews conducted by students with patients and community residents is required.
Prereq. EPI 210b, EPI 211c and permission of the instructor. BIO 209c,d is recommended. Familiarity with underlying principles of epidemiologic studies and methods in psychiatric research is expected.

**EPI 220c,d. Readings in the History of Epidemiology** (FAS History of Science 292r)
Seminars. *One 2-hour session in Cambridge and one 1-hour session at HSPH each week. 5 units.* Dr. Rosenkrantz, Dr. Brandt.
Focuses on the history of the classic texts in modern epidemiology as they have reflected changing views of the etiology of disease. Emphasizes the analysis of primary documents and their impact on medicine and public health. Each student completes a research project and writes it up in the format appropriate to a professional journal. Students are expected to have adequate preparation in the quantitative social sciences.

**EPI 221a. Applications of Epidemiology in Public Health**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.*
Dr. Maclure, Guest Lecturers.
Using the case method, this course shows public health practitioners that whether they are reporting disease, investigating causes, consulting on research, communicating to the public, prescribing to patients, planning a program, managing a health organization, or changing policy, epidemiologic problems, methods and results will often influence their work. Epidemiologic terms and concepts are illustrated and discussed, but neither as deeply nor as quantitatively as in EPI 201a. Recommended for students who do not plan to take more than the minimum School requirement in epidemiology. Students who plan to take further courses in epidemiology methods are advised to take EPI 201a. Credit cannot be received for both this course and EPI 201a.

**EPI 300a,b,c,d,e. Tutorial Programs**
*Time and credit to be arranged.*
Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the Chairman of the Department.

**EPI 350. Research**
In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

*Neoplastic Disease*
Dr. MacMahon, Dr. Boyle, Dr. Gutensohn, Dr. Hsieh, Dr. Hutchison, Dr. Maclure, Dr. Monson, Dr. Yen.

*Environmental Epidemiology*
Dr. Monson.

*Epidemiologic Methods*
Dr. Walker, Dr. Hsieh, Dr. Boyle.

*Nutritional Epidemiology*
Dr. Willett.

*Virus-Associated Chronic Disease*
Dr. Gutensohn.

*Biochemical Epidemiology*
Dr. Maclure.

*Psychiatric Epidemiology*
Dr. Klerman.

**HPM 104a. Introduction to Selected Medical Problems for Non-Physicians**
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Braun.
Provides students who have limited backgrounds in biology and medicine with an introduction to medical science and practice and to medical decision-making. Topics include selected problems that bring patients to health care providers, approaches to differential diagnosis and treatment, and the pathophysiology of a major disease problem. Each student is expected to explore one diagnostic or theapeutic problem in detail in a paper. Required for students in the two-year Health Policy and Management Program General Track.

**HPM 205a,b. Economic Analysis for Public Health**
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hemenway.
Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets and the concept of economic efficiency. Specific topics in health care economics include demand for health care, insurance and the market for physician services. May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 206a,b (formerly HPM 100a,b).

**HPM 206a,b. Economic Analysis**
Lectures, seminars. *Three 2-hour sessions each week. 7.5 units.* Dr. Hemenway.
Designed to bring students to an intermediate-level understanding of economic theory. Emphasizes the uses and limitations of the microeconomic approach.
Required for students in the two-year Health Policy and Management Program and is the first course in the policy sequence.
May be taken for credit by students who previously have taken HPM 205a,b only with permission of the instructor.

**HPM 207a,b. Economics of Health Policy**
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hsiao.
Teaches students to use economic concepts and methods to analyze health policy issues. Applies analytical techniques to dissect complex policy problems and show what insights can be gained. Skills in using several analytical tools are developed, including economic modeling, systematic analysis, econometrics, and simulation. Health policy topics examined using these tools include national health insurance, reimbursement of hospitals and doctors, pro-competition, and facility and manpower planning. Course especially appropriate for students interested in doing policy analysis for the public or private sectors.
Prereq. One semester each of statistics and microeconomics.

**HPM 214d. Meta-Analysis of Clinical Trials and Their Impact on Medical Efficiency**
Seminars. *One two-hour session each week. 1.25 units.* Dr. Chalmers.
Designed as a follow-up to BIO 214c. Concerned with the place which clinical trials have in practice of preventive, diagnostic and therapeutic medicine. Requires an examination of clinical background, specific methodological aspects and reception of results by clinicians.
Related tutorials are conducted throughout the year. Students conduct meta-analysis in a field of their choice. Guidance and collaboration are given in searching literature for RCTs on diagnostic evaluations, gathering and analyzing data, preparing abstracts for presentation and publication.
Prereq. BIO 214c or equivalent or permission of the instructor.

**HPM-BIO 219b, 219c, 219d. Statistical Methods for Health Policy and Management (Module I, II, III)**
Lectures. *Three 2-hour sessions each week. 2.5 units each period.* Dr. Lavin, Dr. Anderson.
Introduces students to probability and statistics emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. The MINITAB package will be used throughout.
**Module I(b):** Topics include: distributions, data display, conditional probability, confidence intervals, hypothesis testing, testing means and proportions, p-value.
**Module II(c):** Topics include: representative sampling, power, study design, sample size determinations, clinical trials, contingency tables, life tables, goodness of fit tests, rate adjustment, non-parametric methods, simple linear regression, correlation and prediction.
**Module III(d):** Topics include: analysis of variance, multiple regression, discriminant analysis, forecasting and analysis of categorical data.
All three modules are required for students in

the two-year Health Policy and Management program and in the management or policy curricula of the one-year Health Services Administration programs.
Sections will be graded separately.
May not be taken for credit by students who previously have taken BIO 200a,b or BIO 201a,b. If substituted for BIO 200 a,b or BIO 201a,b, all three modules must be taken.
Prereq. One college-level course in mathematics. Enrollment of students not in the Department of Health Policy and Management subject to approval of the instructors.

**HPM 220a,b/220c,d. Administrative Systems**
Lectures, seminars. *Three 2-hour sessions each week. 5 units each term.* Dr. Barrett, Members of the Department.
Examines issues related to managing health care organizations and develops skills in a variety of functional areas, including: organizational theory, institutional strategy, leadership, change and conflict, financial accounting and analysis, cost accounting, operations management, marketing, and management control systems. Classes rely principally on the case method of instruction.
Required for students in the two-year Health Policy and Management Program. HPM 220a,b may be taken separately by other students, but only HPM 220a,b/220c,d is an acceptable substitute for HPM 221a,b. HPM 220c,d may not be taken separately.
May be taken for credit by students who previously have taken HPM 221a,b.

**HPM 221a,b. Managing Health Delivery Organizations**
Case discussions, lectures. *Two 2-hour sessions each week plus four additional 2-hour sessions. 5 units.* Members of the Department.
Introduces the management of health delivery organizations. Topics include: organizational issues, financial management, cost accounting, management control systems, and institutional strategy. Uses case method instruction, supplemented by topical readings, as a vehicle for analyzing management problems and evaluating alternative solutions. Relevant managerial concepts and theories are introduced.
Either HPM 221a,b or HPM 220a,b/220c,d is required for students in the M.P.H. program.
May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 220a,b/220c,d.

**HPM 231a,b. Strategic Planning and Organization Design**
Case discussions, lectures. *Two 2-hour sessions each week. 5 units.* Dr. Sapienza.
Includes two conceptually distinct portions: industry/environmental analysis and organization design. The first portion provides the foundation and tools strategy. Once strategy is defined, the manager's next task is to design the organization to achieve that strategy. Using a variety of materials, students will be exposed to such design issues as differentiation, matrix organization, technology and social structure. The final sessions address implementation of design changes.

**HPM 234c. Financial Control in Health Care**
Case studies. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Discusses issues of cost containment and financial control in health care from both a managerial and public policy perspective, develops a conceptual structure for approaching them, and examines how regulatory control systems might be designed to accommodate the unique characteristics of health care systems. Topics include: cost comparisons, capital formation, the role of physicians, management control systems, and regulatory control. Uses both cases and readings. Includes some international as well as U.S. materials.
Prereq. HPM 220a,b/220c,d or equivalent.

**HPM 235d. Seminar on Current Issues in Health Administration**
Seminar. *One 3-hour session each week. 1.25 units.* Dr. Kasten.
Designed to be a state-of-the-art review and analysis of all factors involved in containing hospital costs: providers, intermediaries, regulators, planners, employers, unions, and consumers. First half of class session will be a discussion of relevant literature; second half will be a series of presentations/interactions with outside representatives of specific cost containment efforts.
Auditing not permitted.

**HPM 236c,d. Management in the Health Care Industry** (HBS 1344)
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Herzlinger, Mr. Rhea (Lecturer, Harvard Business School), Dr. Kane.
Focuses on the management issues in health care institutions including: those that deliver health care (hospitals and free-standing facilities); that insure the provision of health care; that supply

drugs, equipment, MIS services, and hospital supplies; that provide research in bio-technology; that provide capital; and that regulate the industry. Explores the strategic choices offered by the newly competitive structure of the industry and the managerial policies needed to execute these choices.
Prereq. HPM 220a,b/220c,d or equivalent, by permission of the instructor.

**HPM 238d. Managing Management Information Systems**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Examines issues relating to effective management of computer-based management information systems. Although some technological issues are addressed on occasion, the principal focus of the course is on topics of systems analysis and design, MIS strategies, and organizational behavior, rather than technology. Uses case method instruction, supplemented by topical readings to focus on the role of a manager in assuring the success of an organization's MIS effort. Includes some international as well as U.S. materials.
Prereq. HPM 220a,b/220c,d,HPM 221a,b or equivalent.

**HPM 239a. Financial Analysis of Hospitals**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane.
Provides the opportunity to develop advanced skills in financial accounting and analysis of financial reports. Covers fund accounting, accounting for inflation, analysis of financial statements, and funds flow. Cases draw on both hospitals and other non-profit organizations.
Prereq. HPM 220a,b/220c,d or equivalent.

**HPM 240a. Toward an Agenda for Public Health**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Roberts.
Provides an overview of the problems of setting priorities in public health. Examines the burden of illness in both advanced and developing societies and the causal role of environmental, economic, and behavioral factors. Discusses ways to measure the burden of ill health and alternative assumptions and implications. Examines ethical positions on how resources should be allocated, and the view of man and society they presume.
Required for students in the Health Policy and Management Department.

**HPM 241b. Health Care Delivery in the U.S.: History and Sociology**
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department.
Offers an introduction to contrasting sociological and historical accounts of the U.S. health care sector. Historical materials and contemporary case studies are used to analyze the roles of providers, patients and other political, cultural and social factors in determining the current objectives and institutional arrangements in this sector. The central role of physicians and "medical science" in health care is emphasized, and its implications for institutional reform explored.
Required for students in the two-year Health Policy and Management Program: General and Medical/Dental Tracks.
Prereq. HPM 240a.

**HPM 242c,d. The Health Care Delivery System: Political and Economic Analysis**
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Feldman, Dr. Hsiao.
Introduction to political analysis and health economics. Examines major health care delivery issues and the development and implementation of policies and programs designed to address them, using several frameworks, including that of economic and political analysis. Topics include: health care finance, health care access and utilization, the supply of and demand for medical care facilities, health care regulation, and competition and national health plans.
Required for students in the two-year Health Policy and Management Program: General and Medical/Dental Tracks.
Prereq. HPM 205a,b, HPM 206a,b or equivalent with permission of the instructor.

**HPM-BEH 243c. Setting and Implementing Priorities in Public Health: The Case for Health Promotion**
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department, Guest Lecturers.
Provides a framework for setting priorities in public health resource allocation. Reviews epidemiologic and intervention studies on lifestyle and environmental risk factors for heart disease, cancer and cerebrovascular disease. Examines economic and political dimensions of mass risk factors. Analyzes strategies for gaining support for and designing health promotion programs.

**HPM 244c,d. Health Services Planning**
*Two 2-hour sessions each week. 5 units.* Dr. J. Brown.
Introduces health planning theory, roles, and methods in the public and private sectors. Teaches and critically examines selected quantitative methods, including incremental cost analysis. Appraises the historical and future roles of health planners and planning in the United States. Designed for all students concerned with long-range resource allocation and its social effects in developed countries, as well as for students preparing for planning or strategic management positions in hospitals and government.
Prereq. Previous course work or background in cost accounting and health economics.

**HPM 248a,b. Contemporary Issues in Health Policy**
To be given 1985-86; offered alternate years.
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Members of the Department.
Examines from a variety of analytic perspectives three to four health policy issues of current political importance. Issues might include, for example, long-term care for the elderly, services for the mentally ill, the dissemination and regulation of medical technology, and/or the impact of "New Federalism" on health funding and health services. Analysis will focus on 1) alternative problem definitions and policy goals, 2) available evidence on policy impacts, and 3) economic, political and other criteria for choosing among various policy alternatives.
Prereq. HPM 240a, 241b, 242c,d or the equivalent introduction to economic and political analysis of the health care system.

**HPM 250d. Policy Implementation**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas.
Intended to help students think systematically about some of the reasons public programs succeed or fail. Assumes that the choice of appropriate and effective institutional arrangements for accomplishing policy goals is itself an important policy question. Examples are taken from a variety of policy areas.
Required for students in the two-year Health Policy and Management Program, and is the third course in the policy sequence.
Presumes knowledge of material presented in HPM 205a,b or HPM 206a,b and HPM-BIO 280c.

**HPM-MCH 252a,b. Public Health Law and Human Rights**
Lectures. *One 2-hour session each week. 3 units.* Dr. Mariner.
Provides an introduction to the U.S. legal system as it affects health care. Emphasis is on concepts of law governing public health programs and distinguishing between legal and moral rights. Among topics considered are rights to medical care; rights of medical patients, the mentally ill, children, and research subjects; due process; equal protection; resource allocation; and problems of balancing personal rights and community protection.
Auditing and convenience attendance not permitted.

**HPM 253e. Government and Private Funding for Research and Health Care Programs**
Lectures, discussions, workshops. *Time to be arranged. 1 unit.* Members of the Department.
To carry out research or develop needed health care programs, managers and policy analysts need to be able to obtain funding from federal, state and local government sources, and from foundations and corporations. This course aims to enable participants to demonstrate in a clear and concise proposal an understanding of the issues and facility with methodological design, and to explore potential sources of funding. Requirements for proper administration of funds are also discussed. Proposals are prepared and critiqued in the workshops.
Prereq. Exposure to research issues in health care or program development and permission of the instructor.
Students should enroll during the first week of **b** period (by November 19, 1985).

**HPM 254c. Risk Management Programs, Quality Controls and Compensation Policies**
Lectures. *Two 2-hour sessions each week. 2.5 units.* Prof. Curran.
Focuses upon the development, implementation and evaluation of risk management programs and legislative reforms in patient compensation plans. Attention is given to medical and hospital malpractice experience, key legal decisions in the area and legislative reform movements setting up arbitration, screening panels, tort-law changes, no-fault mechanisms, etc. The inter-relationship of quality of care standards and quality assurance to malpractice vulnerability and risk management programs is a primary focus of attention.
HPM 257b and HPM 258d advised, but not required.

**HPM 255b. Reimbursement Systems**
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Kane.
Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals.

Issues include: cost containment efforts, hospital perspectives and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.
Introductory courses in financial and cost accounting recommended.

**HPM 256c,d. Health Insurance Industry: Its Structure and Effects on Health Care**
Not given 1985-86; offered alternate years.
Seminar. *One 2-hour session each week. 2.5 units.* Dr. Hsiao.
Examines the health insurance industry and how it affects patients, hospitals, physicians, and dentists. Provides students with an understanding of the industry's structure, the types of firms in this industry, their internal operations, product design, and reimbursement policies. Analyzes how the decisions of insurance firms affect access to health services, diffusion of medical technology, hospital costs, physician and dental fees, and competition in medical care.

**HPM 257b. Physician Performance: Facilitators and Constraints**
Not given 1985-86.
Seminars, case discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Examines circumstances and programs which facilitate or constrain quality of physician performance. Issues discussed include public expectations of physician performance, inherent task constraints, cost-tradeoffs, effect of practice setting and specialization, selection, education, licensure and specialty certification of physicians, malpractice and risk management, impaired physician programs, and utilization review programs.
Experience in medical care delivery an advantage, but not required.
Course is followed by the optional sequels HPM 254c and 258d.

**HPM 258d. Evaluation of Quality of Health Care**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer, Visiting Lecturers.
Examines issues in defining "quality in health care" and the choice of methods for assessing and improving quality of health care. Recent research is reviewed and operating programs, including the PRO program, are analyzed. Presentation includes case materials from quality of care evaluation programs in both hospital and ambulatory settings.
Additional sequel to HPM 254c and HPM 257b.

**HPM 259c. Seminar on Physicians in Organizations: Management Issues**
Not given 1985-86.
Seminars, lectures. *One 2-hour session each week. 1.25 units.* Members of the Department.
Deals with the practical problems of doctors in health organizations—roles, relationships and behavior. Issues include managing—the industrialization of medicine; the M.D. as boss, employee and human being; measures of M.D. behavior; the clinical M.D. in different settings; different types of M.D.; structural and interpersonal conflicts; and legal problems—from different managerial perspectives.
Prereq. Permission of the instructor. Class limited to 25. Preference given to students who have taken HPM 257b and to those who have a commitment to health care management.

**HPM 262c,d. Health Planning and Policy for Developing Countries**
Lectures, seminars. *Two 2-hour sessions each week.* Laboratory. *One 1-hour session each week* (optional). *5 units.* Dr. Shepard, Dr. Cash.
Deals with skills needed for health planning through lectures, problems and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Concepts and techniques of cost-effectiveness analysis, recurrent cost analysis, monitoring of the delivery of health services are taught, applied to health care programs, and practiced with examples. Class is divided into groups which apply these techniques to analyze a planning problem and report their findings through presentations and a memorandum.
ID 209a or experience in developing countries is recommended, but not required. A background in economics is not required.

**POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs**
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Dr. Harkness.
(Course described under Population Sciences.)

**HPM 266d. Program Implementation in Developing Countries**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Henn.
Provides an overview of the circumstances in developing countries which affect the implementation of health programs. Assists students in the adaptation and application of management techniques to deal with typical Third World

health program implementation issues. Topics include: decentralized management, manpower development, community participation, financing, supervision and motivation, logistics, evaluation and redesign, information system development, and donor coordination.

**HPM 267d. Political Economy of International Health**
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reich, Dr. Shaikh.
Examines critical health issues of developing countries in the larger international context of politics and economics. Explores how the relationships between developed countries and developing countries affect the management of health problems and policy. Students are introduced to two contrasting perspectives on development and health: modernization theory and dependency theory. Five case studies are discussed in class to illustrate the constraints and the opportunities created for health professions by the international complexities of domestic health problems.

**HPM 270c. Issues in Mental Health Policy**
Seminars, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Klerman, Guest Lecturers.
Reviews the historical development and current status of policy issues relevant to mental health and mental illness. Detailed attention will be given to the role of government and to identifying areas where further research is needed.

**HPM 274a,b,c,d. Dental Care Administration Research Seminar** (HDS DCA 222)
Lectures, seminars. *One 3-hour session each week. 5 units.* Dr. Douglass.
The fall term concentrates on the research methods of current national studies of the need, supply, demand, and cost of dental care. Policy documents of the A.D.A., I.O.M., O.T.A., Research Triangle Institute, RAND Corp., and the N.C.H.S. are studied. Research designs and data collection methods are reviewed. The spring term emphasizes the research work of faculty and students on relevant dental care policy and management subjects. Grade is based upon participation and the defense of a current research project.

**HPM 275a,b. Dental Public Health and the Dental Care Delivery System**
Seminars, case studies, lectures. *One 2-hour session each week. 2.5 units.* Dr. Antczak, Members of the Department
Reviews basic concepts in dental public health and the dental care delivery systems in the U.S. and other countries. Examines issues of utilization of services, need versus demand for dental care, methods of quality assurance, and the role of government agencies in the provision and regulation of dental care. The effects of alternative methods of financing dental care on utilization and provider incentives will also be discussed.

**HPM 276c,d. Oral Diseases and the Evaluation of Dental Care**
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Antczak, Members of the Department.
Examines basic concepts in the epidemiology of oral diseases and reviews changes in disease prevalence. Discusses the measurement of oral health status and the translation of oral health status into treatment needs for planning purposes. Methods of evaluating dental care are also covered, including: clinical decision making, research design, quality assessment of experimental evidence, and meta-analysis.

**HPM-ESP 277c. Environmental Health Policy Analysis**
Lectures, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas, Dr. Roberts, Dr. Evans.
Using case studies, demonstrates the application of analytic skills to public policy design and implementation. The multidisciplinary approach emphasizes the technical uncertainties and the evaluative and institutional complexities surrounding environmental policy and management. Examples are drawn from air pollution, toxic and hazardous waste control.
Prereq. HPM 206a,b or equivalent, ESP 201a and ESP 202b or equivalent. Required for students in the two-year Health Policy and Management Program: Environmental Track.

**ESP-HPM 278a,b. Operations Management**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Shepard, Dr. Evans.
(Course described under Environmental Science and Physiology.)

**HPM 279c. Quantitative Policy Analysis**
Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Graham.
Introduces students to techniques for analyzing health problems quantitatively. Techniques include decision analysis, cost-effectiveness analysis, and benefit-cost analysis. Readings from health policy and management literature are used to illustrate the techniques and their limitations.
This course *or* HPM-BIO 280c is required for students in the two-year Health Policy and Management Program. Course emphasizes applications to health policy and planning.
Prereq. HPM 205a,b or HPM 206a,b or equivalent.

**HPM-BIO 280c. Decision Analysis for Health and Medical Practices** (KSG S-176m)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units* Dr. Weinstein.
Concerns the methods and applications of decision analysis, cost-effectiveness analysis and cost-benefit analysis in the evaluation of medical technologies and health programs. Applications and limitations stressed. Examples used to illustrate techniques include: treatment decision for acute abdominal pain, coronary artery bypass surgery, cost effectiveness of pharmaceuticals, evaluation of immunization programs, and priority setting for applied biomedical research.
Prereq. BIO 200a,b or 201a,b or HPM-BIO 219b, 219c (may be taken concurrently) or equivalent introductory course in probability and statistics. This course *or* HPM 279c is required for students in the two-year Health Policy and Management Program. Course emphasizes applications to medical technology assessment and health resource allocation.

**HPM-BIO 281d. Seminar on Clinical Decision Analysis**
Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Fineberg, Dr. Barnes.
Intended to enhance the student's ability to conduct independent analyses of medical decisions. Didactic sessions will critically review published analyses and address selected topics, such as evaluation of diagnostic tests, utility assessment and use of computer aids. Presumes knowledge of principles of decision analysis.
Required for students in the two-year Health Policy and Management Program: Medical/Dental Track.
Prereq. HPM-BIO 280c. or permission of the instructor.

**HPM-BIO 282d. Cost-Effectiveness and Cost-Benefit Analysis for Health Program Evaluation**
Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
Topics include: methods and applications of cost-effectiveness and cost-benefit analysis for health program evaluation, medical technology assessment, and environmental risk analysis; theoretical foundations; pricing in non-competitive markets; economic valuation of life saving; choice of discount rates; cost accounting applied to economic evaluation in institutional settings; methods for assessing costs of environmental controls; distribution-sensitive measures of social benefit and cost; health status indexes; modern critiques. Students prepare a written critique of a published analysis, and develop an independent analysis plan of their own choice.
Prereq. HPB 280c, HPM 279c or equivalent; HPM 205a,b, HPM 206a,b or equivalent.

**BIO-HPM 284a,b. Health Decision Theory**
Seminars, lectures. *One 2-hour session each week. 2.5 units.* Members of the Faculty.
(Course described under Biostatistics.)

**BIO-HPM 285a,b. Health Risk Assessment and Appraisal Lectures**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Bailar.
(Course described under Biostatistics.)

**HPM 290a,b,c,d. Applied Research Seminar**
Seminars. *One 2-hour session each week.*
Field work. *One day each week. 10 units.* Dr. J. B. Brown, Dr. Feldman, Members of the Department.
Teaches students to apply analytic and managerial methods to concrete problems. Each student defines and proposes solutions to an important problem confronting an institutional sponsor. Students learn research methods and problem-solving techniques during the "a" period while developing project contracts with sponsors. In subsequent seminar meetings, students, sponsors and faculty advisers present and discuss study methods and findings. Students also meet individually with seminar faculty and designated faculty research advisers. Students prepare a "problem/methods" paper during the first semester and final oral and written reports due at the end of the year.
Required for students in the two-year Health Policy and Management Program.
Prereq. Completion of the first year of the Health Policy and Management Program.

**HPM 295a,b. Doctoral Seminar on Research and Analysis**
Seminar. *One 2-hour session each week. 2.5 units.* Dr. Roberts, Members of the Department.
Reviews the various research methods and analytic approaches that relate to public health and health policy. Explores how to design projects and choose methods appropriate to specific questions they address. The seminar is not intended to explore technical statistical issues, but rather to place research and analysis in their social, institutional and policy context.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or similar background and experience.

**HPM 296a,b. Political and Economic Theory in Health**
Not given 1985-86.
Seminar. *Two 2-hour sessions each week. 5 units.* Dr. Thomas, Mr. Marks.

Examines the uses of political and economic theory in explaining and assessing the operation of health care institutions and the quality of health policy. Contrasts the governing assumptions and reviews contemporary discussions of contractarian, utilitarian, institutionalist, and Marxist perspectives. Topics include: role of markets and political processes; the model of rational behavior; equity, rationality and efficiency in social choice; strategies for reform and social change.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or course work in microeconomics.

**HPM 300a,b,c,d,e. Tutorials**
*Time and credit to be arranged.*
Students may make individual arrangements to do work under the guidance of a member of the Department. This work may include readings or special projects.

**HPM 330e, 330f. Field Work**
*Time and credit to be arranged.*
Students are assigned to work on special projects such as group surveys, other types of field projects or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the Department and is offered through the Community Health Improvement Program.

**HPM 350. Research**
Doctoral candidates may register for HPM 350 to undertake individual study and research.

*Attention is directed to courses described under Interdepartmental Courses.*

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The following courses, offered by the Faculties of Arts and Sciences and Government, are among those that may be of particular interest to students of health policy and management. They are open to qualified students from the School of Public Health.

**Historical Study A-30. the Changing Concept of Race in America** 0692
Half course *(fall term)*. Time to be arranged. Huggins, Rosenkrantz.
An historical exploration and analysis of the concept of race. Topics discussed: changing scientific understandings of race (biological and anthropological constructs); various efforts at empirical definition of racial differences, character, and capacities; political and social implications of race theory; race concepts and personality formation.

**History of Science 144. Health, Disease and Society in Europe and America, since 1770** 0395
Half course *(spring term). M., W., F., at 10* (includes weekly discussion hour). Rosenkrantz and Eyler.
Surveys the history of disease and response to disease from the Enlightenment to the present. Major topics include: disease, dearth and demography; medical theory and therapeutics; health and social change in the Industrial Revolution; bourgeois and popular medical cultures; public health reform and health policy; and an assessment of medicine's influence on mortality, morbidity, and the quality of life. Emphasis on the United States, Britain, France, and Germany.

**History of Science 245r. History of Public Health: Seminar** 7889
Half course *(fall term). M., 2-4.* Rosenkrantz.
The emergence of a scientific point of view distinguishing normalcy, deviance and pathology in the 19th century. The role of new theories and methods in determining these distinctions and their relevance to public health practice during the 19th and early 20th centuries. Special topic for 1985-86: Functions of measurement and quantitative data in public health practice.

**Statistics 100. Introduction to Quantitative Methods**
Half course *(fall term). M., W., F., at 9.* Mosteller.
Introduces students to the design and analysis of empirical studies. Elements of sample surveys, experimental design and observational studies, descriptive and summary statistics for both measured and counted variables, tests of hypotheses including t and F tests, nonparametric procedures, contingency tables, regression with one or more predictors, correlation, and analysis of variance.

**S-171. Issues in Health Policy**
Half course *(spring term). M., W., 12:30-2:00.* Blumenthal, Feldman.
Examination of the ultimate goals of health policy and alternative means for achieving those goals. The current performance of the health care system is discussed, with special emphasis on problems related to the health of our population, the growing cost of health services, and the equity of our health care system.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or similar background and experience.

**MCH 200a. Growth and Development I**
Lectures, self-instructional material. *Two 2-hour seminars/lectures weekly. 2.5 units.* Dr. Valadian.
Instruction in physical growth, development, maturation, and aging is presented in programmed, self-instructional material, and by weekly lectures. Covers topics necessary for the advanced study of growth and development, but also provides an understanding of assets and needs which constitute a basis for health services. Designed for MCH students who do not have a strong background in physical development, but may also be taken by health providers who wish to refresh their knowledge.

**MCH 201b. Growth and Development II: Advanced Seminar**
Seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Describes and integrates the characteristics of human growth and physical development which occur during the selected life stages from conception to maturation. Intended for students with special interest in human development. Considers implication of child growth and development of these periods for health services and further research.
Prereq. MCH 200a or permission of the instructor.

**MCH 202c. Growth and Development III: Factors Affecting Growth and Development**
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasis is placed on understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. This course also considers implications of factors for planning and providing health services and for future research.

**MCH 203e. Primary Maternal and Child Health Care**
Seminars, lectures, field visits. *Full-day sessions. 1.25 units.* Dr. Gardner.
Introduces the student to principles of organization and administration of primary health care services for mothers and children. Concepts of primary care, neighborhood health centers and quality assurance are presented. Seminars focus on the issues and problems presented in the field visits. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, HMO and/or university health care.
Must register by October 15; enrollment limited to 12 students.

**MCH 204a,b. Content of Maternal and Child Health Programs**
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Gardner.
Components of health care programs for mothers and children are discussed as they vary to meet changing needs resulting from growth and maturational processes. Health programs appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require. Also included are the historical background and the relationship of maternal and child health programs to social, mental health, education, and other systems; the course includes a discussion of factors which shape current and future maternal and child health policies and services.

**MCH 205c,d. Planning, Implementation and Evaluation of Maternal and Child Health Programs**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Walker, Members of the Department, Guest Lecturers.
Considers the organization and administration of national, state and local health programs for mothers, infants, children, and adolescents, and services for children with handicapping conditions. Selected issues are examined, such as developmental disorders, Sudden Infant Death Syndrome, day care, and school health. Emphasizes financing, planning, implementing, and evaluating MCH programs in the U.S.

**MCH 206c,d. Maternal and Child Health in Developing Countries**
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Valadian.
Parallels MCH 205c,d. Emphasizes factors which shape MCH programs in rapidly changing social and cultural environments, particularly the interactions between health, nutrition and poverty. Studies selected programs by age periods from various areas of the world and the processes of planning, financing, implementing, and evaluating such programs in relation to other sectors. Individual or small group case study projects are required.

**MCH-NUT 207c,d. Nutrition in Child Growth and Development**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
Principles and practical problems encountered in the nutritional aspects of child growth and development are examined. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

**MCH 208d. Rural Health Services**
Seminars. *Two 2-hour sessions each week. 2.5 units.* Not given 1985-86.
Lectures and discussions focus on the special problems of rural communities affecting MCH services delivery, cultural characteristics, resources available, and innovative approaches to problems, with selected examples in rural areas. Emphasis placed on doing needs/demands assessments or community diagnosis which structure planning for the health needs in isolated communities. Topics include transportation problems, environmental health hazards and rural health concerns in developing countries.

**MCH 209c. Services for Children with Disabilities**
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Crocker.
Provides a review of the handicapping conditions of childhood: mental retardation, physical disability, sensory and communication disorders, and emotional disturbance, as these affect development, adjustment and family resources. The service system will be analyzed with regard to health care, developmental support, education, residential options, and prevention.

**MCH 210b. An Introduction to Personality and Cognitive Development**
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker.
The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis is placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of medical and/or related social and educational services for children and youth.

**MCH 211c. Health Care of Women**
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Gardner.
Considers critical issues of health care and the common problems of women, including the changing role of women in contemporary U.S. society. These health problems are addressed in terms of their epidemiology and the impact of technology on their detection and treatment viewed from biological, medical, behavioral, and legal perspectives.

**MCH 212d. Childhood Mental Disorders: Public Health Perspectives**
Lectures, seminars. *Two 2-hour sessions per week. 2.5 units.* Dr. Deykin, Dr. Rauh.
Examines the occurrence and known risk factors of selected mental disorders of childhood and adolescence, including autism, depression, hyperactivity, and anorexia. Emphasis is on the methodologic issues of case definition, disorder classification, current diagnostic and screening instruments, and on the advantages/disadvantages of available data sources. Readings will include studies selected to illustrate methodologic options and usefulness for public health policy.

**MCH 213d. Obstetric Epidemiology**
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Sachs.
Tackles controversial issues in maternal health through techniques in epidemiology applied to obstetrics. Focuses on maternal mortality, obstetric and gynecologic morbidity, evaluation of obstetric health care, and populations at risk, such as pregnancies in women over 35. Examines the epidemiology of prematurity and current issues such as breast feeding, home births, Cesarian Sections, and fetal monitoring.

**MCH 214a,b. The Elderly Person in the Health Care System** (HMS Geriatrics 702)
*One 2-hour session each week. 2.5 units.* Dr. Laurence Branch (Assistant Professor of Social Medicine and Health Policy, Harvard Medical School).
Uses a variety of public health perspectives to analyze the health needs of the elderly and services to meet them. Topics include: demographic background of the "graying" of America, normal and pathological aging processes, epidemiology of geriatric illness, design and administration of present service programs for elders, and consideration of alternative forms of long-term care.

**MCH 222c. Social Services for Children, Adolescents and Families**
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
Presents the crucial role of social services in maintaining and promoting the health of children and their families. Beginning with a historical overview of social services in the U.S., the course content examines current political trends which structure the content and delivery of social services, drawing comparisons with those in other countries. The social and psychological determinants of the need for social services will focus on events of public health relevance, including terminal illness in childhood, adoption/foster care, family violence, substance abuse, and pregnancy in adolescence.

**HPM-MCH 252a,b. Public Health Law and Human Rights**
Lectures. *One 2-hour session each week. 3 units.* Dr. Mariner.
(Course described under Health Policy and Management.)

**MCH 300a,b,c,d. Tutorials**
*Time and credit to be arranged.*
Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as planning and evaluation of MCH services for children with handicapping conditions.

Tutorials will be offered depending on students' interests and will be limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

**MCH 330. Field Study**
Field study will be arranged on an individual basis to meet the special needs of each student insofar as possible.

**Additional Field Study**
Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year in a program arranged by the staff of the Department. No credit is allowed for such field study.

**MCH 350. Research**
Doctoral students are required to undertake research in maternal and child health.

**NUT 201a,b. Principles of Nutrition**
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Goldman.
Outlines current knowledge of the relationship between diet and human health and provides an introduction to the function of the various elements of nutrition. Consideration is also given to how nutrients may relate to such problems as cancer and heart disease.

**NUT 202c. Nutrition Policy and Management**
*Two 1½-hour sessions each week. 2.5 units.* Dr. Herrera-Acena, Dr. Overholt.
Uses the case study approach to examine the design, planning and implementation of food and nutrition policies, as well as the design and management of specific nutrition programs. Course content focuses on these major topics: programming for vulnerable population groups; food fortification and new foods; marketing and nutrition education; national policies and strategies.
Prereq. NUT 201a,b or NUT 210a,b recommended.

**NUT 204a,b/204c,d. Departmental Seminars**
Seminars. *Two 1-hour sessions each week. 2.5 units each term.* Dr. Owen, Members of the Department.
Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

**NUT 205c,d. Biochemistry and Physiology of Nutrition**
Not given 1985-86; offered alternate years.
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Franceschi, Members of the Department.
The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.
Prereq. Course in biochemistry and permission of the instructors.

**MCH-NUT 207c,d. Nutrition in Child Growth and Development**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
(Course described under Maternal and Child Health.)

**NUT 208c,d. Nutritional Aspects of Human Disease**
Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Mrs. Witschi.
Reviews the role of diet in the causation and management of clinical obesity, diabetes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders considered.

**NUT 209a,b. Food Science and Nutrition**
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.
Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

**NUT 210a,b. Nutrition Problems of Less-Developed Countries**
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena.
The nutrition problems of less-developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

**NUT 214a,b/214c,d. Research Techniques in Nutritional Biochemistry**
Lectures. *One 1-hour session each week.*
Laboratory. *Fifteen hours minimum each week. 5 units each term.* Dr. Geyer, Members of the Program in Nutritional Biochemistry.
Students have the opportunity to rotate through the laboratories (one each period) of faculty members in the Nutritional Biochemistry Program in order to learn current techniques applied to nutritional, cellular and biochemical research. Weekly lectures will emphasize the theory behind the instrumentation utilized in the laboratory. Oral and written presentations of research accomplished by the student to the Nutrition Faculty as required. Generally limited to students in the Nutrition Department.

**NUT-EPI 216a,b. Nutritional Epidemiology**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi.
Reviews methods for assessing dietary intakes of populations and individuals. Students will gain experience in the actual collection, analysis (including conversion to nutrients by computer) and interpretation of dietary intakes. Case studies follow, involving specific diet disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments.
Prereq. BIO 200,a,b or BIO 201a,b, EPI 201a and permission of the instructor for students who have not taken a course in nutrition.

**NUT 217c,d. Neurochemical and Dietary Factors in Cardiovascular Disease**
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Verrier.
The problem of cardiovascular disease is discussed in the context of contemporary research in nutrition, neuropharmacology and applied physiology. The course will be based on material from textbooks and original papers. Emphasis will be placed on the potential clinical applications of this multidisciplinary approach.
Prereq. Courses in biochemistry and physiology and permission of the instructor.

**NUT 300a,b,c,d,e. Tutorial Programs**
*Time and credit to be arranged.*
Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition or library research.

**NUT 351-368. Research**
*Time and credit to be arranged.*
Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

351 Dr. Geyer.
Effects of growth factors and hormones on the metabolism of human cells in culture; nutrition and metabolism of isolated organs; complete blood replacement *in vivo* with artificial preparations.

352 Dr. Goldman.
The metabolism of food constituents and drugs, particularly as carried out by intestinal bacteria. Emphasis given to areas of metabolism that may help to understand a compound's biological activity.

353 Dr. Lown.
Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.

356 Dr. Antoniades.
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.

358 Dr. Herrera-Acena.
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.

362 Dr. Verrier.
Influence of neural factors, psychologic conditioning and myocardial ischemia on susceptibility to ventricular arrhythmias and sudden death.

363 Mrs. Witschi.
Computer-based interactive dietary history, analysis and counseling programs.

364 Dr. Reinhold.
Structural characterization of glycoconjugates on biosurfaces by high performance liquid chromatography, gas chromatography and mass spectrometry.

366 Dr. Franceschi.
Control of intestinal calcium absorption by 1,25-dihydroxyvitamin $D_3$, a steroid hormone. Regulation of gene expression by steroid hormone receptors. Mechanism of intestinal calcium transport.

368 Dr. Owen.
Hormonal regulation of nutrient uptake and membrane function in human cells. Mechanism of action of growth factors. Regulation of amino acid transport and protein synthesis.

369 Dr. Sul.
Regulation of lipogenic and glycolytic enzymes by hormonal and nutritional factors and alteration of this regulation in the diabetic state.

Admission limited and subject to approval of the instructor.

**POP 191a,b. The Spatial Order of Societies** (Sociology 191)
Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.
Stresses the interaction of societies and their geography, focusing primarily on the historic and current development of the United States. Consideration is given to technology, institutions, ideology, health, the economy, and other factors.

**POP 200a,b. Introduction to Population Sciences**
Lectures. *One 2-hour session each week. 2.5 units.* Professor Bell, Members of the Department.
Reviews the basic elements of population change—fertility, mortality and migration—and their interaction with social, cultural and economic characteristics of societies for both developed and developing countries. Introduces basic demographic concepts and methods, including age-sex pyramids, life tables and demographic rates.

**POP 201a,b. Introductory Seminar on Population Sciences**
Not offered 1985-86.
Seminars. *One 2-hour session each week. 2.5 units.* Members of the Department.
Supplements the introduction to population sciences presented in POP 200a,b. Most students will be concurrently enrolled in 200a,b. Through in-depth study of two or three defined human communities, students learn how to trace immediate and underlying causes of rates of birth, death and migration as they have changed through the past one or two centuries, with inferences for the goals of public health and population policies and programs. Short papers are required.

**POP 202c,d. Student Project Design Seminar**
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Dr. Harkness.
Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.
Prereq. Introductions to biostatistics, epidemiology and (preferably) population sciences. Enrollment after interview with the instructor.

**POP 204c,d. Biological Basis for Fertility Control**
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Salhanick, Members of the Department.
Presents the fundamental physiology and biochemistry related to known and potential methods of family planning. Topics include: the biosynthesis, secretion, effects and modes of action of the gonadal, gonadotropic and hypothalamic hormones and the relationship of the natural steroid hormones to synthetic analogues is also discussed. A short paper or presentation may be required.
Prereq. Appropriate science background or permission of the instructor.

**POP 205a,b. Introduction to Demographic Analysis**
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Potter.
Reviews fundamentals of the measurement and analysis of mortality, nuptiality, fertility, migration, population growth, and age structure. Topics include: sources of demographic data, demographic rates, cohorts and periods, model life tables and models of nuptiality and fertility, stable population theory, and population projections. Students will have the opportunity to analyze the demographic future of selected countries such as the United States, Mexico and China.

**POP 206c,d. Demographic Methods for Developing Countries**
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Larson.
Reviews methods for estimation and analysis of mortality and fertility rates from limited and faulty data obtained from censuses, surveys, maternity histories, and vital registration systems. Topics include: estimation of infant, child and adult mortality; age- and duration-specific fertility rates; determinants of birth intervals; and evaluation of family planning programs. Students participate in discussions of recent literature and statistical analyses of levels and trends in demographic rates.
Prereq. An introductory course in population.

**POP 207a,b. Social Science Approaches to Population Change**
Lectures, *Two 2-hour sessions each week. 5 units.* Dr. Potter, Dr. Mertens.
Reviews major contributions and debates in the social sciences with respect to theories of population change and causes of fertility, mortality and migration. Focuses both on historical European experience and on societies in the contem-

porary developing world.
Short papers are required.

**POP 209a,b. Foundations of Agricultural Sciences** (Biology 195) (*Given at HSPH*)
Not offered 1985-86.
Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Levins.
Examines patterns of world food production as they develop from the interaction of social and biological systems: evolution of agro-ecosystems, principles of plant growth and productivity, pests and diseases, ecology of farming systems, consequences of technical choices, issues of agricultural change, and research strategies.
Prereq. Course in biology or permission of the instructor.

**POP 212c,d. Economics of Population Growth** (Economics 1263)
Not offered 1985-86.
Lectures, discussions. *Two 1-hour sessions each week with a third hour at the discretion of the instructor. 5 units.* Dr. Leibenstein, Dr. Potter.
Emphasizes effects of population growth on problems of underdeveloped countries. Examines the welfare economics of population control, relations between population growth and resources, age-structure effects on demographic and economic variables, economic determinants of fertility change, and the population obstacle to economic growth.
Prereq. POP 200a,b and HPM 205,a,b or equivalent.
**Note:** This course is given in Cambridge.

**POP 214c,d. The Biological Determinants of Fecundity, Environmental Factors and Population Growth**
Not offered 1985-86.
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Frisch.
Examines the direct effect of environmental factors such as nutrition and physical activity on female and male reproductive ability throughout the reproductive span. Topics include: adolescent growth, age of menarche, effects of exercise on the menstrual cycle, male maturation, age-specific fertility, pregnancy wastage, lactational amenorrhea and the birth interval, and age of menopause. Also included are the basic physiology and endocrinology of human reproduction, the history of birth control and the interaction of biological factors and social customs affecting population growth.

**POP 216c,d. Comparative Analysis of Public Policies in Developing Countries** (KSG S-552, Government 2110)
Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. John D. Montgomery (Professor of Public Administration, John F. Kennedy School of Government).
Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts. Surveys Third World policies for dealing with such problems as population (fertility and migration); malnutrition; land reform; and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

**POP 217b. Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries**
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Berggren, Dr. Wyon.
Helps students distinguish within communities those kinds of persons at high risk of serious illness, death and unwanted births. It uses data from studies at national and local levels to trace underlying causes of these events as the basis for designing feasible, effective and simple preventive measures. Provides foundation for POP 202c,d and for other health and population courses considering policies and programs.
Prereq. Introductory courses in biostatistics, epidemiology and (preferably) population sciences.

**POP 220d. Human Ecology**
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Levins.
Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. For each area of ecology, general principles will first be considered, followed by examples from different human societies. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems.
Prereq. Assumes basic knowledge of biology.

**POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs**
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Dr. Harkness.
A managerial perspective on the problems of developing and implementing population and primary health care programs in Third World nations. Problems are examined from the level of managers of clinics, community and national programs. Topics covered primarily through case studies based on family planning and primary health care programs, particularly at the community and regional levels.

**POP 300a,b,c,d. Tutorial Programs**
*Time and credit to be arranged.*
Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs or analysis of data.

**POP 330e,330f. Field Studies**
Field studies are held during the week between the fall and spring terms *or* the week between the two halves of the spring term. Students should sign up for one choice only; the week chosen will be at the discretion of the tour directors. Organized by Haitian graduates of the School and cosponsored by the Department of Population Sciences and the Office of International Health. Students must sign up for the course with the Department by October 15. The estimated 1985-86 cost is $1,500, which includes air fare, accommodations, honorarium, and faculty time. Partial financing of the course is the responsibility of the student and should be arranged as early as possible in the academic year.
Dr. Berggren, Dr. Cash.

*Field Trip to Haiti*
The objective of this field study is to provide exposure to the urban, rural and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners. Students are required to give a talk to Haitian colleagues and to write a report.
Enrollment limited to 10 and subject to approval of the instructors.

**POP 350-355. Research**
*Time and credit to be arranged.*
Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.
Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Field Studies and Programs*
Dr. Wyon, Dr. Guerrero, Dr. Berggren.

351 *Biomedicine and Reproductive Physiology*
Dr. Salhanick.

352 *Demography*
Dr. Potter.

353 *Population Ethics*
Dr. Dyck.

354 *Biological Determinants of Fertility*
Dr. Frisch.

355 *Complex Systems*
Dr. Levins.

356 *Migration and Development*
Dr. Stark.

The following courses, offered by other faculties of Harvard University, are among those that may be of particular interest to students of population sciences. They are open to qualified students from the School of Public Health.

**Ethics 2965. Seminar: Ethical Aspects of Population Policy**
Half course (*spring term*). *Hours to be arranged.* Dyck.
A critical analysis of past and contemporary questions concerning human rights, with particular attention to questions of pro-creative rights and fertility-influencing policies.

**Sociology 251. Seminar: Social Policy and Population Issues in the Developed Countries**
Not offered 1985-86.
Half course (*spring term*). *M., 2-4.* Alonso.
A broad range of issues in the developed countries, including education, health, housing, social security, status of women, labor policy, and racial and group prejudice, are affected by declining fertility, growing up of the baby boom generation and international migration. Stresses social processes involved and the policy responses proposed and tried out. (Offered in FAS.)

**Sociology 272. Seminar: Models of Association and Movement**
Half course (*spring term*). *Th., 1-3.* Alonso, Rytina.
Reviews traditional approaches and recent advances in the modeling of tabular data. Model selection, estimation, and interpretation of log-linear models are compared with less widely known alternatives. Applications to substantive problems of mobility, migration, and social networks are considered.

**TOX 204a. Introduction to Principles of Toxicology**
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Credit will be given only upon successful completion of this course *and* ESP 233c. Dr. Rice, Members of the Laboratory.
This course is a prerequisite for ESP 233c Industrial Toxicology and may not be taken in isolation. The course content is identical to the first half of TOX 205a,b Principles of Toxicology.
Prereq. Organic chemistry and mammalian physiology.

**TOX 205a,b. Principles of Toxicology (HMS Pharm. 713., FAS Pharm. 218)**
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Rice, Members of the Laboratory.
Emphasizes mechanisms of injury resulting from exposure to environmental chemicals at the molecular, cellular, organ and organismal levels. Methods used to detect, evaluate, analyze, and alleviate the toxic effects of chemicals are discussed.
Prereq. Organic chemistry and mammalian physiology.

**TOX 208a,b/209c,d. Seminar in Toxicology**
Seminars. *One 1-hour session each week. 1 unit each term.* Dr. Samson, Members of the Laboratory.
Includes seminars, journal clubs and discussions of topics in basic research and the current literature in toxicology.
Prereq. Background in toxicology or related fields and permission of the instructor.

**TOX 210a,b/211c,d. Advanced Toxicology**
Lectures, discussions, seminars. *One 2-hour session each week.*
Laboratory. *To be arranged. 5 units.* Dr. Tashjian, Members of the Laboratory.
Examines experimental methods of research in toxicology. Includes individual laboratory work.
Prereq. TOX 205a,b or equivalent and permission of the instructor.

**TOX 300a,b,c,d. Tutorial Programs**
*Time and credit to be arranged.*
Dr. Tashjian, Members of the Laboratory.
Opportunities are provided for tutorial work in molecular, cellular, biochemical, and environmental toxicology.
Prereq. Permission of the instructor.

**TOX 350. Research**
Doctoral candidates may undertake laboratory research in toxicology under the direction of a faculty member.
Drs. Tashjian, Eisenstadt, Ofner, Rice, Samson, Schonbrunn, and Toscano.

*Nita Bikkal, research assistant in the Laboratory of Toxicology, changing the media of cell stock.*

**TPH 201a. Ecology, Epidemiology and Control of Important Parasitic Diseases of Developing Areas**
Lectures, seminars, demonstrations. *Two 1-hour sessions and one 2-hour session each week. 3 units.* Dr. David, Members of the Department, Guest Lecturers.
Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

**TPH 202b. Epidemiology of Infectious Diseases of Public Health Importance in Developing Countries**
Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Dr. Weisfeld, Guest Lecturers.
The epidemiology of infectious diseases of public health importance in developing countries will be thoroughly reviewed. Only those diseases caused by bacteria or virus will be discussed. Emphasis will be placed on the epidemiology patterns of these diseases as they relate to different geographic and socioeconomic environments. Methods of disease surveillance, especially as they relate to prevention and control, will also be stressed. Case studies will be used with student teams proposing solutions to the problems.
Enrollment limited to 60 and subject to approval of the instructors if students have no previous background in health care delivery.

**TPH 203b. Mycobacterioses**
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Koch-Weser, Dr. Piessens, Dr. Patel, Dr. Boom, Guest Lecturers.
Covers the immunobiology of mycobacteria and worldwide epidemiology, clinical diagnosis and treatment of tuberculosis, leprosy and diseases caused by other mycobacteria. Also deals with laboratory diagnosis, BCG vaccination, chemoprophylaxis, prevention and tuberculosis control in Massachusetts, the U.S. and other countries. Problem cases will be presented.
Prereq. Simultaneous enrollment in TPH 202b and permission of the instructors. A previous background or interest in epidemiology and biology of infectious diseases is expected.

**TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections**
Lectures, laboratory, seminars. *Two 3-hour sessions each week. One 2-hour additional laboratory session each week, to be arranged. 5 units.* Dr. Pan.
Emphasizes laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites maintained and examined with respect to detection and quantification of infection, immunity and control.
Enrollment limited to 15 and subject to approval of the instructors. Preference given to concentrators in tropical public health and cancer biology.

**TPH 205c. Clinical and Pathologic Features of Tropical Diseases**
Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. David, Dr. Maguire, Dr. Dammin, Dr. Franz von Lichtenberg (Professor of Pathology, Harvard Medical School), Members of the Department, Members of the Pathology Department.
Designed for students particularly interested in tropical medicine. Emphasis is on the clinicopathologic aspects of tropical diseases. At each session, disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed.
Enrollment subject to approval of the instructors.

**TPH 206d. Principles of Public Health Entomology**
Lectures, laboratories, seminars, field trips. *One 3-hour session each week. 2.5 units.* Dr. Spielman, Dr. Ribeiro.
The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.
Prereq. TPH 201a or suitable biology background and permission of the instructors.

**TPH 207c. Principles of Vector Physiology**
Lectures, discussions. *One 1-hour session and one 2-hour session each week. 1.25 units.* Dr. Ribeiro, Dr. Spielman.
Presents the physiology of blood-sucking arthropods in a series of lectures and discussions. This course aims to provide the student with an interest in arthropod-borne diseases and a base of insect physiology that will enable a comprehensive view of the interaction between pathogen/vector at a biochemical/physiological level. Each session requires reading up to five papers in the literature and writing answers to problem sets.
Prereq. Background in biology and biochemistry and permission of the instructors.

**TPH 208d. Current Problems in Schistosomiasis**
Lectures and seminars. *One 2-hour session each week. 2 units.* Dr. Chernin, Members of the Department.
The problems posed by schistosomiasis as an expanding health hazard are presented in a series of lectures and seminars. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease and to the potentials of various approaches to control.
Prereq. TPH 201a or permission of the instructors.

**TPH 210c. Current Problems in Malariology**
Lectures, seminars. *One 2-hour session each week. 2 units.* Dr. Jungery, Dr. Spielman, Members of the Department.
Reviews the biology of the malaria parasite, emphasizing factors that particularly affect transmission and human morbidity and mortality. Introduces the principles of malariometry and the strategies for controlling malaria. Analyzes current control programs in seminar discussions.
Prereq. TPH 201a and permission of the instructors.

**TPH 216c,d. The Biology of Parasitism** (HMS Imm. 721.0, FAS Imm. 214)
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. David, Dr. Wirth, Members of the Department, Guest Lecturers.
Covers aspects of the biology, immunology and molecular biology of various protozoa and helminths. Includes discussion on the mechanism of immune evasion, mechanism of antigenic variation, and the biology and immunology of malaria, schistosomes, filariae, leishmania, amoeba, and trypanosomes. Each session requires reading three or four papers in the literature and writing answers to problem sets.
Prereq. Suitable course in basic immunology and biology and permission of the instructors.

**TPH 300a,b,c,d,e. Tutorial Programs**
Laboratory exercises. *Time and credit to be arranged.* Individual work for candidates at the master's degree level may be carried out under supervision of a member of the Department. Various parasites of medical importance are maintained and are available for studies on immunology, molecular biology, cell biology, biochemistry, and chemotherapy. Arrangements subject to approval of the instructor.

**TPH 350. Research**
Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Chairman of the Department.
Members of the Department are currently engaged in the following areas of research:

*Biology, host-parasite relationships and control of protozoa and helminths*

*Population genetics, nutrition and reproduction of medically important arthropods*

*Immunology of protozoa and helminths*

*Molecular biology of protozoa and helminths*

*Arthropod transmission of viral, protozoan and helminthic agents*

*Cultivation* in vitro *of parasitic helminths and protozoa of medical importance*

*Facing page, Dr. Dyann Wirth, Assistant Professor of Tropical Public Health.*

# *Officers of Instruction and Research*

**William Alonso**, A.B., M.C.P (Harvard University); Ph.D. (University of Pennsylvania), Richard Saltonstall Professor of Population Policy (*Population Sciences*).

**David Alan Amato**, A.B. (Colgate University); S.M., Ph.D. (Cornell University), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Mary Ochsenhirt Amdur**, S.B. (University of Pittsburgh); Ph.D. (Cornell University), Associate Professor of Toxicology (*Environmental Science and Physiology*); *Lecturer, Massachusetts Institute of Technology.*

**James Robert Anderson**, A.B. (State University of New York at Buffalo); Ph.D. (University of Washington at Seattle), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Harry Nicholas Antoniades**, B.S., Ph.D. (Athens University, Greece), Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston.*

**John Christian Bailar, III**, A.B. (University of Colorado); M.D. (Yale University); Ph.D. (American University), Lecturer on Biostatistics; *Senior Science Adviser, U.S. Department of Health and Human Services.*

**Robert Bruce Banzett**, S.B. (Pennsylvania State University); Ph.D. (University of California at Davis), Assistant Professor of Physiology (*Environmental Science and Physiology*).

**Benjamin Ayer Barnes**, S.B. (Harvard College); M.D. (Columbia Medical School), Lecturer on Health Policy and Management; *Associate Professor of Surgery, Harvard Medical School.*

**Diana Barrett**, A.B. (Sweet Briar College); S.M. (Boston University); M.B.A., D.B.A. (Harvard University), Lecturer on Management (*Health Policy and Management*).

**Colin Banks Begg**, B.Sc., Ph.D. (Glasgow University), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**David Elliott Bell**, A.B. (Pomona College); A.M., LL.D. (hon.) (Harvard University),Clarence James Gamble Professor of Population Sciences and International Health (*Population Sciences*), Director of the Center for Population Studies and Acting Director of the Takemi Program in International Health.

**Gretchen Mary Berggren**, A.B. (Nebraska State College); M.D. (University of Nebraska); S.M. in Hyg. (Harvard University), Lecturer on Population Sciences.

**Bengt Erik Bjarngard**, M.Sc., D.Sc. (University of Lund, Sweden), Lecturer on Medical Radiation Physics (*Environmental Science and Physiology*); *Professor of Radiation Therapy, Harvard Medical School.*

**Elkan Rogers Blout**, A.B. (Princeton University); Ph.D. (Columbia University); A.M. (hon.) (Harvard University); D.Sc. (hon.) (Loyola University), Member of the Faculty of Public Health and Dean for Academic Affairs; *Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School.*

**Joseph David Brain**, A.B. (Taylor University); S.M., S.M. in Hyg., S.D. in Hyg. (Harvard University), Professor of Physiology (*Environmental Science and Physiology*).

**Laurence George Branch**, A.B. (Marquette University); A.M., Ph.D. (Loyola University), Associate Professor of Social Psychology *(Maternal and Child Health); Associate Professor of Preventive and Social Medicine, Harvard Medical School.*

**Peter Braun**, S.B. (Yale University); M.D. (Columbia University), Lecturer on Public Health (*Health Policy and Management*).

**J. Larry Brown**, A.B. (Anderson College), A.M. (University of California, Los Angeles), M.S.W., Ph.D. (Brandeis University), Lecturer on Health Services (*Health Policy and Management*) and Director of the Community Health Improvement Program.

**Jonathan Bernard Brown**, S.B. (Portland State University); M.P.P., Ph.D. (Harvard University), Assistant Professor of Public Policy in Health Planning (*Health Policy and Management*).

**William Alfred Burgess**, S.B. (Tufts University); S.M. (Harvard University), Associate Professor of Occupational Health Engineering (*Environmental Science and Physiology*); *Corporate Manager of Industrial Hygiene, Polaroid Corp.*

**James Preston Butler**, A.B. (Pomona College); A.M., Ph.D. (Harvard University), Associate Professor of Biomathematics (*Environmental Science and Physiology*).

**John Cairns**, M.D., B.A., B.M.,B.Ch., D.M. (Oxford University); A.M. (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

**Richard Alan Cash**, S.B. (University of Wisconsin); M.D. (New York University); M.P.H. (The Johns Hopkins University), Director, Office of International Health Programs, and Lecturer on Tropical Public Health; *Institute Fellow, Harvard Institute for International Development.*

**Eli Chernin**, S.B. (College of City of New York); A.M. (University of Michigan); S.D. (The Johns Hopkins University); A.M. (hon.) (Harvard University), Professor of Tropical Public Health.

**Paul David Cleary**, S.B., S.M., Ph.D. (University of Wisconsin), Lecturer on Behavioral Sciences; *Assistant Professor of Social Medicine, Harvard Medical School.*

**Allen Carrol Crocker**, A.B. (Massachusetts Institute of Technology); M.D. (Harvard University), Lecturer on Maternal and Child Health; *Associate Professor of Pediatrics, Harvard Medical School.*

**Allen Latham Cudworth**, B.E.E. (University of Alabama); M.E.E. (Massachusetts Institute of Technology); S.D. in Hyg. (Harvard University), Lecturer on Applied Acoustics and Environmental Health (*Environmental Science and Physiology*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center.*

**William John Curran**, J.D. (Boston College); LL.M., S.M. in Hyg. (Harvard University), Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health*).

**John Rouben David**, A.B. (College of the University of Chicago); M.D. (University of Chicago Medical School); A.M. (hon.) (Harvard University), John LaPorte Given Professor of Tropical Public Health; *Professor of Medicine, Harvard Medical School.*

**Richard Dennis**, S.B. (Northeastern University); S.M. (Harvard University), Associate Professor of Applied Environmental Health Engineering (*Environmental Science and Physiology*); *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford.*

**Guy Blaudin de Thé**, M.D. (University of Marseille Faculty of Medicine); Ph.D. (University of Paris - Sorbonne), Lecturer on Microbiology (*Cancer Biology*); *Professor, Université Claude Bernard, France.*

**Eva Yona Deykin**, A.B. (Radcliffe College); S.M. (Simmons College); M.P.H., Dr.P.H. (Harvard University), Associate Professor of Social Work (*Maternal and Child Health*).

**Jeffrey Mark Drazen**, S.B. (Tufts University); M.D. (Harvard University), Associate Professor of Physiology (*Environmental Science and Physiology*); *Associate Professor of Medicine, Harvard Medical School.*

**Margaret Elizabeth Drolette**, A.B. (Radcliffe College); M.P.H., Ph.D. (Harvard University), Professor of Biostatistics; Chief Coordinator of the Master of Public Health Program.

**Johanna Todd Dwyer**, S.B. (Cornell University); S.M. (University of Wisconsin); S.M. in Hyg., S.D. in Hyg. (Harvard University), Lecturer on Maternal and Child Health Nutrition (*Maternal and Child Health*); *Director, Stern Nutrition Center, Tufts Medical Center.*

**Arthur James Dyck**, A.B. (Tabor College); A.M. (University of Kansas); Ph.D. (Harvard University), Mary B. Saltonstall Professor of Population Ethics; *Member of the Faculty of the Harvard Divinity School.*

**Eric Eisenstadt**, A.B., Ph.D. (Washington University), Associate Professor of Microbiology (*Cancer Biology* and *Toxicology*).

**Michael John Ellenbecker**, B.E.E. (University of Minnesota); S.M. (University of Wisconsin); S.M. in Env.H., S.D. in Env.H. (Harvard University), Assistant Professor of Industrial Hygiene Engineering (*Environmental Science and Physiology*).

**Myron Elmer Essex**, S.B. (University of Rhode Island); D.V.M., S.M. (Michigan State University); Ph.D. (University of California); A.M. (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

**John Stephen Evans**, B.S.E., S.M. (University of Michigan); S.M. in Env.H., S.D. in Env.H. (Harvard University), Assistant Professor of Environmental Science (*Environmental Science and Physiology*).

**James Joseph Feeney**, A.B. (Dartmouth College); M.D. (Harvard University), Member of the Faculty of Public Health; *Director of the Medical Area Health Service.*

**Henry Arthur Feldman**, A.B. (Swarthmore College); A.M., Ph.D. (Harvard University), Associate Professor of Applied Mathematics (*Environmental Science and Physiology* and *Biostatistics*).

**Penny Hollander Feldman**, A.B. (Radcliffe College); A.M., Ph.D. (Harvard University), Lecturer on Political Science (*Health Policy and Management*).

**Michael Lawrence Feldstein**, B.A., M.Math. (University of Waterloo); Ph.D. (State University of New York at Buffalo), Associate Professor of Biostatistics.

**Benjamin Greeley Ferris, Jr.**, A.B., M.D. (Harvard University); D.H.C. (hon.) (University of Bordeaux), Professor of Environmental Health and Safety (*Environmental Science and Physiology*); *Director of Environmental Health and Safety, University Health Services.*

**Harvey Vernon Fineberg**, A.B., M.D., M.P.P., Ph.D. (Harvard University), Dean of the Faculty of Public Health and Professor of Health Policy and Management.

**Dianne Madelyn Finkelstein**, A.B. (University of California, Berkeley); A.M. (Wayne State University); Ph.D. (University of Michigan), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Renny Theodore Franceschi**, S.B. (University of Vermont); Ph.D. (Purdue University), Assistant Professor of Biochemistry (*Nutrition*).

**Howard Stanley Frazier**, Ph.B. (University of Chicago); M.D. (Harvard University), Director of the Institute for Health Research and Member of the Faculty of Public Health (*Health Policy and Management*); *Professor of Medicine, Harvard Medical School.*

**Rose Epstein Frisch**, A.B. (Smith College); A.M. (Columbia University); Ph.D. (University of Wisconsin), Associate Professor of Population Studies (*Population Sciences*).

**Jane Gardner**, S.B., S.M. (Boston College); S.M. in M.C.H., S.D. in M.C.H. (Harvard University), Assistant Professor of Maternal and Child Health.

**Richard David Gelber**, S.B. (Cornell University); S.M. (Stanford University); Ph.D. (Cornell University), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Rebecca Sue Gelman**, A.B. (University of Michigan); Ph.D. (State University of New York at Buffalo), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Robert Pershing Geyer**, S.B., S.M., Ph.D. (University of Wisconsin); A.M. (hon.) (Harvard University), Professor of Nutrition.

**Laurie Hollis Glimcher**, A.B. (Radcliffe College); M.D. (Harvard University), Assistant Professor of Immunology (*Cancer Biology*); *Assistant Professor of Medicine, Harvard Medical School.*

**Peter Goldman**, B. Eng. Phys. (Cornell University); A.M. (Harvard University); M.D. (The Johns Hopkins University), Professor of Health Sciences in Nutrition and Director of the Division of Biological Sciences in Public Health; *Maxwell Finland Professor of Clinical Pharmacology, Harvard Medical School.*

**Steven Lawrence Gortmaker**, A.B. (University of Michigan); S.M., Ph.D. (University of Wisconsin), Associate Professor of Sociology (*Behavioral Sciences*).

**John David Graham**, A.B. (Wake Forest University); A.M. (Duke University); Ph.D. (Carnegie-Mellon University), Assistant Professor of Policy and Decision Sciences (*Health Policy and Management*).

**Robert James Gray**, A.B. (Whitman College); S.M., Ph.D. (Oregon State University), Assistant Professor of Biostatistics.

**Ian Alexander Greaves**, B.Med.Sc., M.B., B.S. (Monash University, Australia), Assistant Professor of Occupational Health (*Environmental Science and Physiology*).

**Robert Arthur Greenes**, A.B. (University of Michigan); M.D., Ph.D. (Harvard University), Member of the Faculty of Public Health (*Biostatistics*); *Associate Professor of Radiology, Harvard Medical School.*

**Nancy Mueller Gutensohn**, A.B. (Beloit College); S.M. in Epid., S.D. in Epid. (Harvard University), Associate Professor of Epidemiology.

**Tamara K. Hareven**, A.B., (Hebrew University); A.M. (Cincinnati University); Ph.D. (Ohio State University), Lecturer on Population Studies (*Population Sciences*); *Professor, Clark University.*

**David Paul Harrington**, A.B. (Tufts University); A.M., Ph.D. (University of Maryland), Associate Professor of Biostatistics.

**Joseph John Harrington**, B.C.E. (Manhattan College); A.M., Ph.D. (Harvard University), Professor of Environmental Health Engineering (*Environmental Science and Physiology* and *Population Sciences*) in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences.

**William Alan Haseltine**, A.B. (University of California, Berkeley); Ph.D. (Harvard University), Associate Professor of Microbiology (*Cancer Biology*); *Associate Professor of Pathology, Harvard Medical School.*

**John Hedley-Whyte**, B.A., M.B., B.Chir., M.A., M.D. (Cambridge University, England), Member of the Faculty of Public Health (*Health Policy and Management*); *David S. Sheridan Professor of Anaesthesia and Respiratory Therapy, Harvard Medical School.*

**David Hemenway**, A.B. (Harvard University); A.M. (University of Michigan); Ph.D. (Harvard University), Lecturer on Political Economy (*Health Policy and Management*).

**Albert Edwin Henn**, S.M. (Michigan State University); M.D. (Wayne State University); M.P.H. (Harvard University), Lecturer on Health Policy and Management; *Joint Coordinator for International Health Projects, Harvard Institute for International Development.*

**Manuel Guillermo Herrera-Acena**, A.B., M.D. (Harvard University), Lecturer on Nutrition; *Research Associate, Harvard Institute for International Development.*

**Regina Elbinger Herzlinger**, S.B. (Massachusetts Institute of Technology); D.B.A. (Harvard University), Member of the Faculty of Public Health (*Health Policy and Management*); *Professor of Business Administration, Harvard Business School.*

**Howard Haym Hiatt**, M.D. (Harvard University); Sc.D. (hon.) (Northeastern University), Professor of Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management).*

**Donald Frederick Hornig**, S.B., Ph.D. (Harvard University), Alfred North Whitehead Professor of Chemistry in Public Health (*Environmental Science and Physiology*); Director of Interdisciplinary Programs in Health.

**William Ching-Lung Hsiao**, A.B. (Ohio Wesleyan University); M.P.A., Ph.D. (Harvard University), Professor of Health Systems Economics (*Health Policy and Management*); *Member of the Faculty of Harvard Business School.*

**Chung-cheng Hsieh**, M.P.H. (National Taiwan University); S.M. in Epi., S.D. (Harvard University), Assistant Professor of Epidemiology.

**George Barkley Hutchison**, A.B., M.D., M.P.H. (Harvard University), Professor of Epidemiology.

**Roland Harrison Ingram, Jr.**, S.B. (University of Alabama); M.D. (Yale University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Parker V. Francis Professor of Medicine, Harvard Medical School.*

**Michele Jungery**, S.B. (University of Colorado); S.M. (University of Colorado); M.P.H., Ph.D. (University of California, Berkeley), Assistant Professor of Tropical Public Health.

**Nancy Morgan Kane**, S.B. (Simmons College); M.B.A., D.B.A. (Harvard University), Assistant Professor of Management (*Health Policy and Management*).

**Jack Kasten**, S.B. (Michigan State University); M.P.H. (University of Michigan); J.D. (Boston College), Lecturer on Health Services Administration (*Health Policy and Management); Vice President, Arthur D. Little, Inc., Cambridge.*

**Ann Randtke Kennedy**, A.B. (Vassar College); S.M. in Env. H., S.D. in Phys. (Harvard University), Associate Professor of Radiobiology (*Cancer Biology*).

**Gerald Lawrence Klerman**, A.B. (Cornell University); M.D. (New York University); A.M. (hon.) (Harvard University), Lecturer on Epidemiology; *Professor of Psychiatry, Harvard Medical School.*

**Dieter Koch-Weser**, M.D. (Faculty of Medicine, University of Sao Paulo, Brazil); S.M., Ph.D. (Northwestern University), Lecturer on Tropical Public Health.

**Stephen William Lagakos**, S.B. (Carnegie-Mellon University); M.Phil., Ph.D. (George Washington University), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Nan McKenzie Laird**, S.B. (University of Georgia); Ph.D. (Harvard University), Associate Professor of Biostatistics.

**Martin Graham Larson**, A.B., S.M., S.D. in Bios. (Harvard University), Assistant Professor of Biostatistics and Population Sciences; *Co-Director, Biometry Unit, Robert B. Brigham Multipurpose Arthritis Center.*

**Philip Todd Lavin**, A.B. (University of Rochester); Ph.D. (Brown University), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Alexander Leaf**, S.B. (University of Washington); M.D. (University of Michigan Medical School); A.M. (Harvard University), Member of the Faculty of Public Health; *Ridley Watts Professor of Preventive Medicine and Clinical Epidemiology, Harvard Medical School.*

**David Evan Leith**, A.B. (Lehigh University); M.D. (Harvard University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Associate Professor of Anaesthesia, Harvard Medical School.*

**C. Robin LeSueur**, B.A., B.S.W. (University of Toronto); M.L.S. (Columbia University), Member of the Faculty of Public Health and the Faculty of Medicine; *Librarian of the Francis A. Countway Library of Medicine.*

**Richard Levins**, A.B. (Cornell University); Ph.D. (Columbia University), John Rock Professor of Population Sciences.

**Howard Jules Levy**, S.B., S.M., M.B.A. (Rensselaer Polytechnic Institute), Member of the Faculty of Public Health and Associate Dean for Finance and Operations.

**Richard Charles Lewontin**, A.B. (Harvard University); A.M., Ph.D. (Columbia University), Member of the Faculty of Public Health (*Population Sciences*); *Alexander Agassiz Professor of Zoology, Harvard University.*

**John Bertram Little**, A.B. (Harvard University); M.D. (Boston University), Professor of Radiobiology (*Cancer Biology*) and Director of the Kresge Center for Environmental Health.

**Stephen Hathaway Loring**, A.B. (Amherst College); B.M.S. (Dartmouth Medical School); M.D. (Harvard University), Assistant Professor of Physiology (*Environmental Science and Physiology*).

**Thomas Arthur Louis**, A.B. (Dartmouth College); Ph.D. (Columbia University), Associate Professor of Biostatistics.

**Bernard Lown**, S.B. (University of Maine); M.D. (The Johns Hopkins University), Professor of Cardiology in Nutrition.

**Mohamed Sayed el Lozy**, M.B., B.Ch. (University of Cairo); M.D., Ph.D. (University of Alexandria), Associate Professor of Nutrition.

**Kenneth Malcolm Maclure**, B.A. (Oxford University), S.M. in Epid., S.D. (Harvard University), Assistant Professor of Epidemiology.

**Brian MacMahon**, M.D., D.P.H., Ph.D. (University of Birmingham, England); S.M. in Hyg. (Harvard University), M.D. (hon.) (University of Athens), Henry Pickering Walcott Professor of Epidemiology.

**Wendy Kathleen Mariner**, A.B. (Wellesley College); J.D. (Columbia University); LL.M. (New York University); M.P.H. (Harvard University), Assistant Professor of Health Law (*Health Policy and Management*).

**William Edward McAuliffe**, A.B. (The Johns Hopkins University); A.M. (Washington University); Ph.D. (The Johns Hopkins University), Lecturer on Sociology (*Behavioral Sciences*).

**Jere Mead**, S.B., M.D. (Harvard University), Cecil K. and Philip Drinker Professor of Environmental Physiology (*Environmental Science and Physiology*).

**Cyrus Rustam Mehta**, B.Tech. (Indian Institute of Technology), S.M., Ph.D. (Massachusetts Institute of Technology), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Charles Marie Joseph Mertens de Wilmars**, M.D., Lic. en Psych. (Catholic University of Louvain, Belgium), Visiting Professor of Psychiatry (*Behavioral Sciences*); *Professor of Medical Psychology, Faculty of Medicine, Catholic University of Louvain, Belgium.*

**Olli Sakari Miettinen**, M.D. (University of Helsinki); M.P.H., M.Sc., Ph.D. (University of Minnesota), Professor of Epidemiology and Biostatistics (on leave 1985-86).

**Dade William Moeller**, S.B., S.M. (Georgia Institute of Technology); Ph.D. (North Carolina State College), Professor of Engineering in Environmental Health (*Environmental Science and Physiology*) and Associate Dean for Continuing Education.

**Richard Redding Monson**, S.B. (North Dakota State University); M.D., S.M. in Hyg., S.D. in Hyg. (Harvard University), Professor of Epidemiology and Director of the Educational Resource Center for Occupational Health and Safety.

**C. Frederick Mosteller**, S.B., S.M. (Carnegie Institute of Technology); A.M., Ph.D. (Princeton University); S.D. (hon.) (Wesleyan University); S.D. (hon.) (University of Chicago); S.D. (hon.) (Carnegie-Mellon University); S.S.D. (hon.) (Yale University), Roger Irving Lee Professor of Mathematical Statistics (*Health Policy and Management* and *Biostatistics*); *Professor of Mathematical Statistics in the Faculty of Arts and Sciences; Member of the Faculty of Medicine, Harvard Medical School.*

**James Ivan Mullins**, A.B. (University of South Florida); Ph.D. (University of Minnesota), Assistant Professor of Virology (*Cancer Biology*).

**Roger Loyd Nichols**, A.B. (Cornell College); M.D. (University of Iowa); A.M. (hon.) (Harvard University), Professor of International Health (*Population Sciences*); *Director of the Boston Museum of Science.*

**Peter Ofner**, B.Sc. (University of London), A.R.I.C. (Associate of Royal Institute of Chemistry of Great Britain and Northern Ireland), Ph.D. (University of London), Lecturer on Toxicology; *Director, Steroid Biochemistry Laboratory, Shattuck Hospital.*

**Ann Rosenthal Oliver**, A.B. (Smith College); Ed.M. (Harvard University); M.P.H. (University of Hawaii), Member of the Faculty of Public Health and Assistant Dean for Academic Administration.

**Albert Joseph Owen, III**, S.B. (University of Rhode Island); Ph.D. (Harvard University), Assistant Professor of Biochemistry (*Nutrition*).

**Marcello Pagano**, B.Sc. (University of Cape Town); S.M. (University of Florida); Ph.D. (The Johns Hopkins University), Professor of Statistical Computing and Director of the Health Sciences Computing Facility.

**Ruth Heather Palmer**, B.A., M.B., B.Ch. (Cambridge University, England); S.M. in Hyg. (Harvard University), Lecturer on Health Services (*Health Policy and Management*) and Associate Dean for Students.

**Ralph Seal Paffenbarger**, A.B. (Ohio State University), M.D. (Northwestern University), M.P.H., Dr.P.H. (The Johns Hopkins University), Visiting Professor of Epidemiology; *Professor of Epidemiology, Stanford University.*

**Steve Chia-Tung Pan**, B.S. (Tokyo Jikeikai Premedical College); M.D. (Tokyo Jikeikai Medical College); M.P.H. (Harvard University), Professor of Tropical Public Health.

**Norman Henry Peterson**, Member of the Faculty of Public Health and Assistant Dean for Administrative Services.

**Chester Middlebrook Pierce**, A.B., M.D. (Harvard University), Professor of Education and Psychiatry in the Faculty of Medicine, the Graduate School of Education and the Faculty of Public Health (*Behavioral Sciences*).

**Willy Frans Piessens**, B.S. (College te en van Melle, Belgium); M.D. (Free University of Brussels), Member of the Faculty of Public Health (*Tropical Public Health*); *Associate Professor of Medicine, Harvard Medical School.*

**Joseph Earl Potter**, A.B. (Yale University); M.P.A., Ph.D. (Princeton University), Associate Professor of Demography (*Population Sciences*).

**Michael Robin Reich**, A.B., A.M., Ph.D. (Yale University), Lecturer on International Health (*Health Policy and Management*); Assistant Director of the Takemi Program in International Health.

**Vernon Nye Reinhold**, S.B., S.M. (University of New Hampshire); Ph.D. (University of Vermont), Lecturer on Biological Chemistry in the Faculty of Public Health (*Nutrition*) and the Faculty of Medicine.

**Jose Marcos Chaves Ribeiro**, M.D. (State University of Rio de Janeiro); Ph.D. (Biophysics Institute, Rio de Janeiro), Assistant Professor of Tropical Public Health.

**Robert Hafling Rice**, S.B. (Massachusetts Institute of Technology), Ph.D. (University of California), Assistant Professor of Toxicology.

**Julius Benjamin Richmond**, S.B., S.M., M.D. (University of Illinois), Professor of Health Policy in the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health*) and the Faculty of Medicine; *Director of the Harvard University Division of Health Policy Research and Education.*

**Marc Jeffrey Roberts**, A.B., Ph.D. (Harvard University), Professor of Political Economy (*Health Policy and Management*).

**James Matthew Robins**, M.D. (Washington University), Assistant Professor of Occupational Health (*Environmental Science and Physiology*).

**Barbara Gutmann Rosenkrantz**, A.B. (Radcliffe College); Ph.D. (Clark University), Professor of the History of Science in the Faculty of Arts and Sciences and the Faculty of Public Health (*Health Policy and Management*).

**Benjamin Paul Sachs**, M.B., B.S., M.R.C.S., L.R.C.P. (St. Mary's Medical School, London University); D.P.H. (University of Toronto), Assistant Professor of Obstetrics and Gynecology in the Faculty of Medicine and the Faculty of Public Health (*Maternal and Child Health).*

**Hilton Aaron Salhanick**, A.B., A.M., Ph.D. (Harvard University); M.D. (University of Utah), Frederick Lee Hisaw Professor of Reproductive Physiology (*Population Sciences*); *Professor of Obstetrics and Gynecology, Harvard Medical School.*

**Leona Dorothy Samson**, B.S. (University of Aberdeen); Ph.D. (University of London), Assistant Professor of Toxicology.

**Alice Marie Sapienza**, S.B. (Stonehill College); A.M. (Boston College); M.B.A., D.B.A. (Harvard University), Assistant Professor of Management (*Health Policy and Management*).

**David Alan Schoenfeld**, A.B. (Reed College); A.M., Ph.D. (University of Oregon), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Agnes Schonbrunn**, B.Sc. (McGill University); Ph.D. (Brandeis University), Associate Professor of Toxicology.

**Ascher Jasha Segall**, M.D. (University of Lausanne, Switzerland); M.P.H., Dr.P.H. (Harvard University), Lecturer on Health Services (*Health Policy and Management*); *Professor of Epidemiology, School of Medicine, Boston University; Professor of Education, School of Education, Boston University.*

**Jacob Shapiro**, S.B. (City College of New York); S.M. (Brown University); Ph.D. (University of Rochester), Lecturer on Biophysics in Environmental Health (*Environmental Science and Physiology*); *Radiological Health and Safety Engineer to the University Health Services.*

**Donald Sloane Shepard**, A.B., M.P.P., Ph.D. (Harvard University), Associate Professor of Operations Management and Operations Research (*Health Policy and Management*); *Economist, Veterans' Administration Outpatient Clinic.*

**Herbert Sherman**, B.E.E. (College of the City of New York); M.E.E., D.E.E. (Polytechnic Institute of Brooklyn), Lecturer on Health Services Administration (*Health Policy and Management*) and Associate Director of the Institute for Health Research.

**Stover Hoffman Snook**, A.B. (Hartwick College); A.M. (Fordham University); Ph.D. (Tufts University), Lecturer on Ergonomics (*Environmental Science and Physiology*); *Project Director, Liberty Mutual Insurance Company.*

**Frank Irwin Speizer**, A.B., M.D. (Stanford University), Associate Professor of Epidemiology (*Environmental Science and Physiology*); *Associate Professor of Medicine, Harvard Medical School.*

**John Daniel Spengler**, S.B. (University of Notre Dame); Ph.D. (State University of New York at Albany); S.M. in Env. H. (Harvard University), Professor of Environmental Health (*Environmental Science and Physiology).*

**Andrew Spielman**, S.B. (Colorado College); S.D. (The Johns Hopkins University), Professor of Tropical Public Health.

**Oded Stark**, B.A., B.A. (Hebrew University of Jerusalem); Ph.D. (University of Sussex), Visiting Associate Professor of Economics and Population (*Population Sciences*); *Visiting Associate Professor of Economics and Population in the Faculty of Arts and Sciences; and Senior Lecturer, Economics, Bar-Ilan University, Israel.*

**William Boaz Stason**, S.B. (University of Michigan); M.D., S.M. in Epid. (Harvard University), Associate Professor of Health Services Administration (*Health Policy and Management*).

**Hei Sook Sul**, B.S. (Ewha University, Korea); S.M., Ph.D. (University of Wisconsin), Assistant Professor of Biochemistry (*Nutrition*).

**Armen Haig Tashjian, Jr.**, M.D. (Harvard University), Professor of Toxicology; *Professor of Pharmacology, Harvard Medical School.*

**Stephen Richard Thomas**, A.B. (Oberlin College); A.M., Ph.D. (Harvard University), Assistant Professor of Political Science and Environmental Policy (*Health Policy and Management*).

**William Augustine Toscano**, S.B., S.M. (Indiana University); Ph.D. (University of Illinois), Assistant Professor of Toxicology.

**Dimitrious Vassiliou Trichopoulos**, M.D. (University of Athens Medical School); S.M. in Hyg. (Harvard University), Visiting Professor of Epidemiology; *Professor of Hygiene and Epidemiology, University of Athens Medical School.*

**Anastasios Athanasios Tsiatis**, S.B. (Massachusetts Institute of Technology); Ph.D. (University of California, Berkeley), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

**Isabelle Valadian**, M.D. (Faculte Française de Medicine, Beirut, Lebanon); M.P.H. (Harvard University), Professor of Maternal and Child Health.

**Peter Alexander Valberg**, A.B. (Taylor University); A.M., S.M., Ph.D. (Harvard University), Associate Professor of Physiology (*Environmental Science and Physiology*).

**Richard Leonard Verrier**, A.B. (University of New Hampshire); Ph.D. (University of Virginia), Associate Professor of Physiology (*Nutrition*).

**Warren Ernest Clyde Wacker**, M.D. (George Washington University); A.M. (hon.) (Harvard University), Member of the Faculty of Public Health; Henry K. Oliver Professor of Hygiene; *Director of University Health Services.*

**Alexander Muir Walker**, A.B., M.P.H., M.D., Dr. P.H. (Harvard University), Associate Professor of Epidemiology.

**Deborah Klein Walker**, A.B. (Mt. Holyoke College); Ed.M., Ed.D. (Harvard University), Assistant Professor of Human Development (*Behavioral Sciences* and *Maternal and Child Health*).

**James Hutchinson Ware**, A.B. (Yale University); Ph.D. (Stanford University), Associate Professor of Biostatistics.

**Edward William Webster**, B.Sc., Ph.D. (University of London), Lecturer on Medical Radiation Physics (*Environmental Science and Physiology*); *Professor of Radiology (Physics), Harvard Medical School.*

**Henry Wechsler**, A.B. (Washington and Jefferson College); A.M., Ph.D. (Harvard University), Lecturer on Social Psychology (*Behavioral Sciences*); *Research Director, The Medical Foundation, Inc.*

**Milton Charles Weinstein**, A.B., A.M., M.P.P., Ph.D. (Harvard University), Professor of Policy and Decision Sciences (*Biostatistics* and *Health Policy and Management*).

**Walter Churchill Willett**, M.D. (University of Michigan); M.P.H., Dr.P.H. (Harvard University), Associate Professor of Epidemiology.

**Dyann Fergus Wirth**, A.B. (University of Wisconsin at Madison); Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Tropical Public Health.

**Jelia Cox Witschi**, S.B. (West Virginia University); S.M. (Case Western University), Lecturer on Nutrition.

**John Benjamin Wyon**, B.A., M.B., B.Ch. (Cambridge University); M.P.H. (Harvard University), Senior Lecturer on Population Studies (*Population Sciences*).

**Marvin Zelen**, S.B. (City College of New York); A.M. (University of North Carolina); Ph.D. (American University), Professor of Statistical Science (*Biostatistics*); *Member of the Faculty of Arts and Sciences; Director of Statistics Unit, Dana-Farber Cancer Institute.*

**Walter Pierce Allen**, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Keaven Martin Anderson**, Ph.D., Visiting Lecturer on Biostatistics.

**Alexia Anne Antczak**, D.M.D., Dr.P.H., Instructor in Dental Public Health (*Health Policy and Management*).

**Jorge Ramon Arias**, Ph.D., Visiting Lecturer on Tropical Public Health.

**Kenneth Alfred Arndt**, M.D., Lecturer on Occupational Dermatology (*Environmental Science and Physiology*).

**Nicholas Askounes Ashford**, Ph.D., J.D., Visiting Lecturer on Occupational Health Policy (*Environmental Science and Physiology*).

**Antoine Augustin**, M.D., M.P.H., Visiting Lecturer on Population Sciences.

**Edward Lamar Baker, Jr.**, M.D., M.P.H., S.M. in Phys., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**Susan Pardee Baker**, M.P.H., Visiting Lecturer on Injury Prevention (*Environmental Science and Physiology*).

**Kay Walker Bander**, S.M. in H.S.Ad., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

**John Alan Barmack**, M.B.A., Lecturer on Occupational Health Management (*Environmental Science and Physiology*).

**Robert Charles Benfari**, M.B.A., Ph.D., S.M. in Hyg., Lecturer on Psychology (*Behavioral Sciences*).

**Judith Dolin Bentkover**, Ph.D., Visiting Lecturer on Economics (*Health Policy and Management*).

**Arthur Angelo Berarducci**, M.P.H., Lecturer on Health Services Administration (*Health Policy and Management*).

**Warren Lee Berggren**, M.D., Dr.P.H., Visiting Lecturer on Tropical Public Health.

**Donald Mark Berwick**, M.D., M.P.P., Lecturer on Health Services (*Health Policy and Management*).

**Laurence Herbert Bishoff**, S.B., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Kenneth Dale Bloem**, S.M. in H.P.&M., Visiting Lecturer on Health Services (*Health Policy and Management*).

**David Blumenthal**, M.D., M.P.P., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Leslie Irvin Boden**, Ph.D., Lecturer on Occupational Health (*Environmental Science and Physiology*).

**John Dunning Boice, Jr.**, S.D. in Epid., Visiting Lecturer on Epidemiology.

**Thomas John Bossert**, Ph.D., Visiting Lecturer on International Health (*Health Policy and Management*).

**Peter Boyle**, B.S., Instructor in Biostatistics and Epidemiology.

**Thomas Ball Bracken**, LL.B., Visiting Lecturer on Community Air Pollution (*Environmental Science and Physiology*).

**Alfred Andreas Buck**, M.D., M.P.H., Sc.D., Visiting Lecturer on Tropical Public Health.

**Stanley Gene Burchfield**, M.B.A., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Sheldon Daniel Bycoff**, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Debra Lynn Caplan**, M.P.A., Visiting Lecturer on Health Policy and Management.

**Juan Emilio Carrillo**, M.D., M.P.H., Instructor in Health Policy (*Health Policy and Management*).

**Lincoln Chih-ho Chen**, M.D., M.P.H., Visiting Lecturer on Population Sciences.

**David Christopher Christiani**, M.D., M.P.H., S.M. in Phys., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**Vincent Matthew Ciriello**, D.Sc., Visiting Lecturer on Biomechanics (*Environmental Science and Physiology*).

**Shepard Nathan Cohen**, M.P.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Philip Timothy Cole**, M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

**Earl Francis Cook**, S.D., Lecturer on Epidemiology.

**John Paul Corley**, S.B., Visiting Lecturer on Environmental Radiation Surveillance (*Environmental Science and Physiology*).

**Susan Mary Cotter**, D.V.M., Visiting Lecturer on Cancer Biology.

**Daniel William Cramer**, M.D., S.D., Lecturer on Epidemiology.

**Kathleen Ridder Crampton**, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**John Eustace Cupples**, M.Th., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Lawrence Hugh Daltroy**, Dr.P.H., Instructor in Behavioral Sciences.

**Gustave John Dammin**, M.D., Lecturer on Tropical Public Health.

**Maureen Chambers DeFuria**, S.M. in H.P.&M., Visiting Lecturer on Health Policy and Management.

**Carole Ruth Dichter**, S.D., Lecturer on Nutrition.

**Chester William Douglass**, D.D.S., M.P.H., Ph.D., Lecturer on Public Health Dentistry (*Health Policy and Management*).

**David Dressler**, Ph.D., Lecturer on Microbiology (*Cancer Biology*).

**Karin Arntz Dumbaugh**, A.M., S.M. in H.S.Ad., S.D., Lecturer on Health Services (*Health Policy and Management*).

**Bruce Anthony Egan**, S.M. in M.E., S.D. in Env.H., Visiting Lecturer on Air Pollution Meteorology (*Environmental Science and Physiology*).

**Robert Curtis Ellison**, M.D., S.M. in Epid., Lecturer on Epidemiology.

**Manning Feinleib**, M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

**Robert George Feldman**, M.D., Lecturer on Neurology (*Environmental Science and Physiology*).

**Mark George Field**, Ph.D., Lecturer on Health Services Administration (*Health Policy and Management*).

**William David Finkle**, Ph.D., Visiting Lecturer on Epidemiology.

**Nicholas John Fiumara**, M.D., M.P.H., Visiting Lecturer on Infectious Diseases (*Cancer Biology*).

**William Herbert Foege**, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

**Frances Gail Forster**, S.M. in Env. H., Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

**Edwin Martin Gold**, M.D., Visiting Lecturer on Maternal and Child Health (*Maternal and Child Health*).

**Rose Hannah Goldman**, M.D., M.P.H., M.O.H., Instructor in Occupational Medicine (*Environmental Science and Physiology*).

**Richard Rafael Gonzalez**, Ph.D., Visiting Lecturer on Environmental Science and Physiology.

**Michele Louise Gougeon**, M.S.S., S.M. in H.S.Ad., Lecturer on Health Policy and Management.

**George Francis Grady**, M.D., Visiting Lecturer on Applied Microbiology (*Cancer Biology*).

**William Frank Greenlee**, Ph.D., Visiting Lecturer on Toxicology.

**Edward Greer**, J.D., M.P.H., Visiting Lecturer on Occupational Health Law (*Environmental Science and Physiology*).

**Rodrigo Guerrero**, M.D., S.M. in Hyg., Dr.P.H., Visiting Lecturer on Population Sciences.

**Judith Allen Hall**, Ph.D., Lecturer on Behavioral Sciences.

**S. Katharine Gilbert Hammond**, Ph.D., S.M. in Env. H., Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

**Lucia Stein Hatch**, M.P.H., Visiting Lecturer on Health Policy and Management.

**Alice Jane Hausman**, Ph.D., M.P.H., Lecturer on Population Studies (*Population Sciences*).

**Kenneth Cronise Hayes**, D.V.M., Ph.D., Lecturer on Nutrition.

**James Hester**, Ph.D., Visiting Lecturer on Health Policy and Management.

**Christine Lee Hobart**, D.B.A., Lecturer on Labor Relations (*Health Policy and Management*).

**Diane Elizabeth Hoffman**, S.M. in H.P.&M., Visiting Lecturer on Health Policy and Management.

**Frank Macmillan Holden**, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

**William Henry Hollinshead, III**, M.D., M.P.H., Lecturer on Maternal and Child Health (*Maternal and Child Health*).

**Marcel Rene Hommel**, Ph.D., Visiting Lecturer on Tropical Public Health.

**Donald Roswell Hopkins**, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

**Eleanor May Irish**, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Rudolph John Jaeger**, Ph.D., Visiting Lecturer on Occupational and Environmental Toxicology (*Environmental Science and Physiology*).

**Brent Carl James**, S.M., M.D., Lecturer on Biostatistics.

**Hershel Jick**, M.D., Lecturer on Epidemiology.

**G. Timothy Johnson**, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Warren Kantrowitz**, M.D., Visiting Lecturer on Occupational Medicine(*Environmental Science and Physiology*).

**Myra Leonore Karstadt**, Ph.D., J.D., Lecturer on Occupational Health, (*Environmental Science and Physiology*).

**Ralph Leo Kent, Jr.**, S.D. in Bios., Visiting Lecturer on Biostatistics.

**David Grant Kern**, M.D., M.O.H., S.M. in Phys., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**Jonathan David Klein**, M.D., M.P.H., Visiting Lecturer on Behavioral Sciences.

**Anthony Leader Komaroff**, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Jeffrey Powell Koplan**, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**John Richard Agwin Lakey**, Ph.D., Visiting Lecturer on Radiological Health (*Environmental Science and Physiology*).

**Philip John Landrigan**, M.D., M.Sc., Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Marc Karnis Landy**, Ph.D., Lecturer on Political Science (*Health Policy and Management*).

**Patricia Ann Lane**, Ph.D., Visiting Lecturer on Population Sciences.

**Chwen-Ching Lee**, S.M. in H.P.&M., Visiting Lecturer on Health Policy (*Health Policy and Management*).

**Charles Levenstein**, Ph.D., S.M. in Phys., Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Sol Levine**, Ph.D., Visiting Lecturer on Behavioral Sciences.

**Barry Steven Levy**, M.D., M.P.H., Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Frederick Pei Li**, M.D., Lecturer on Epidemiology.

**Matthew Heng Liang**, M.D., M.P.H., Lecturer on Health Services (*Health Policy and Management*).

**Stephen Lorch**, S.B., Lecturer on Health Services Administration (*Health Policy and Management*).

**James Harvey Maguire**, M.D., M.P.H., Instructor in Tropical Public Health.

**Thomas William Mangione**, Ph.D., Lecturer on Biostatistics.

**Harry Milton Marks**, A.M., Instructor in Health Policy (*Health Policy and Management*).

**Robert John Marra**, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Leonardo Jimenez Mata**, S.D. in Hyg., Visiting Lecturer on Tropical Public Health.

**Patricia Jane McArdle**, Ed.D., S.M. in Epid., Instructor in Behavioral Sciences.

**Eleanor Thomsen McFadden**, A.M., Lecturer on Biostatistics.

**Edward Noel McIntosh**, M.D., S.D. in Popl., Visiting Lecturer on Population Sciences.

**Edward H. Michelson**, Ph.D., Visiting Lecturer on Tropical Public Health.

**Louis Howard Miller**, M.D., Visiting Lecturer on Tropical Public Health.

**Richard Francis Mollica**, M.D., Lecturer on Mental Health Policy (*Health Policy and Management*).

**Edward Joseph Montminy**, M.P.A., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

**Eileen Morley**, Ed.D., Visiting Lecturer on Organizational Behavior (*Health Policy and Management*).

**Robert Morris**, D.S.W., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Alan Sydney Morrison**, M.D., S.D. in Epid., Lecturer on Epidemiology.

**Richard Harold Morrow**, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

**Samuel Leonard Moschella**, M.D., Visiting Lecturer on Tropical Public Health.

**George Boswell Moseley, III**, M.B.A., J.D., Lecturer on Health Law (*Health Policy and Management*).

**Kenneth Eugene Mott**, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

**William Boss Munier**, M.D., M.B.A., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

**Brian Logan Murphy**, Ph.D., Visiting Lecturer on Environmental Risk Assessment (*Environmental Science and Physiology*).

**Raymond Leo Harrington Murphy, Jr.**, M.D., M.P.H., S.D. in Hyg., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**H. Richard Nesson**, M.D., Lecturer on Health Services (*Health Policy and Management*).

**Franklin Allen Neva**, M.D., Visiting Lecturer on Tropical Public Health.

**Eli Herbert Newberger**, M.D., S.M. in Epid., Lecturer on Child Health (*Maternal and Child Health*).

**Robert James Nicolosi**, Ph.D., Lecturer on Nutrition.

**Ruth Sonntag Nussenzweig**, M.D., Ph.D., Visiting Lecturer on Tropical Public Health.

**L. Christine Oliver**, M.D., M.P.H., S.M. in Phys., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**Catherine Austin Overholt**, S.D. in H.P.&M., Lecturer on Nutrition.

**Leonard Dominic Pagnotto**, S.M., Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

**Theodore Michael Pass**, Ph.D., Lecturer on Health Policy and Management.

**Mercio Expedito Alves Pereira**, M.D., Ph.D., Visiting Lecturer on Tropical Public Health.

**Thomas Oakley Pyle**, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Mitchell Thornton Rabkin**, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Mark Lewis Rosenberg**, M.D., M.P.P., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Jacqueline Miller Rosenthal**, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Fay Adrienne Rozovsky**, J.D., M.P.H., Visiting Lecturer on Health Law (*Health Policy and Management*).

**James Ryan**, M.D., Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Kenneth Wayne Samonds**, Ph.D., Visiting Lecturer on Nutrition.

**Elizabeth Woodland Sands**, J.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Philip Earl Sartwell**, M.D., M.P.H., Visiting Lecturer on Epidemiology.

**A. Faye Schrater**, Ph.D., Visiting Lecturer on Immunoparasitology (*Tropical Public Health*).

**Jack M. Selby**, S.B., Visiting Lecturer on Radiation Protection (*Environmental Science and Physiology*).

**Stuart Howard Shapiro**, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Alan Peter Sheldon**, M.B., B.Chir., S.M. in Hyg., Lecturer on Behavioral Sciences (*Health Policy and Management*).

**Adrian Charles Sydney Sleigh**, M.B., B.S., M.P.H., Lecturer on Tropical Public Health.

**Temple Ferris Smith**, Ph.D., Lecturer on Molecular Biophysics (*Biostatistics*).

**Thomas Jay Smith**, M.P.H., Ph.D., Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

**Patricia Ann Sohl**, M.D., M.P.H., Visiting Lecturer on Health Policy (*Health Policy and Management*).

**Nancy Lee Sprince**, M.D., M.P.H., Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

**Kenneth Earl Stanley**, Ph.D., Visiting Lecturer on Epidemiology.

**Allen Howard Storm**, M.D., M.P.H., Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Donald Ernest Strange**, M.B.A., Visiting Lecturer on Health Policy and Management.

**Thomas John Stranova**, M.P.H., Visiting Lecturer on Health Policy and Management.

**Phillip George Stubblefield**, M.D., Visiting Lecturer on Maternal Health (*Maternal and Child Health*).

**James Oliver Taylor**, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

**Mark Smith Thompson**, Ph.D., Visiting Lecturer on Health Policy (*Health Policy and Management*).

**Patricia Hyland Travers**, S.M., Visiting Lecturer on Occupational Health Nursing (*Environmental Science and Physiology*).

**Eoin William Trevelyan**, D.B.A., Lecturer on Management (*Health Policy and Management*).

**Richard William Valachovic**, D.M.D., M.P.H., S.M. in H.S.Ad., Lecturer on Dental Public Health (*Health Policy and Management*).

**Michael Oliver Varner**, S.M. in Hyg., Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

**Franz Cornelius von Lichtenberg**, M.D., Lecturer on Tropical Public Health.

**Christine Waternaux**, Ph.D., Lecturer on Biostatistics.

**Carl Norman Wathne**, S.M., Visiting Lecturer on Health Services (*Health Policy and Management*).

**David Howe Wegman**, M.D., S.M. in Phys., Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

**Ralph Robert Weichselbaum**, M.D., Visiting Lecturer on Radiobiology (*Cancer Biology*).

**Jason Stanley Weisfeld**, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

**Peter Fahey Weller**, M.D., Visiting Lecturer on Tropical Public Health.

**Barbara Graham Werner**, Ph.D., Visiting Lecturer on Microbiology (*Cancer Biology*).

**Jay Andrew Winsten**, Ph.D., Lecturer on Health Services (*Health Policy and Management*).

**Michele Sandra Winsten**, S.M. in H.P.&M., Visiting Lecturer on Health Policy and Management.

**Joe David Wray**, M.D., M.P.H., Visiting Lecturer on Population Sciences.

**Grace Wyshak**, Ph.D., Lecturer on Biostatistics.

**Lynne Margaret Ausman**, S.D. in Nutr., Research Associate in Nutrition.

**Tamara Eugenia Awerbuch**, Ph.D., Research Associate and Lecturer on Biostatistics.

**Lester Carl Bartholow**, S.D. in Nutr., Visiting Research Associate in Nutrition.

**Barbara Doris Beck**, Ph.D., Research Associate in Physiology (*Environmental Science and Physiology*).

**Paul Cushwa Billings**, Ph.D., Research Associate in Radiobiology (*Cancer Biology*).

**Charles Myron Blatt**, M.D., Research Associate in Cardiology (*Nutrition*).

**Ruth Margaret Butler**, S.M., Research Associate in Social Work (*Maternal and Child Health*).

**Gerald Lokchung Chan**, S.D. in Phys., Research Associate in Cancer Biology.

**Shu-heh Wang Chu**, Ph.D., Research Associate in Nutrition.

**Letitia Katherine Davis**, Ed.M., S.D., Research Associate in Occupational Health (*Environmental Science and Physiology*).

**Kenneth Demerjian**, Ph.D., Visiting Scientist in Environmental Science and Physiology (to November 1985).

**Douglas William Dockery**, S.D. in Env. H., Research Associate in Environmental Health (*Environmental Science and Physiology*).

**Ellen Aura Eisen**, S.D., Research Associate in Occupational Health (*Environmental Science and Physiology*).

**Eric Eliot Fortess**, S.D., Visiting Research Associate in Health Administration (*Institute for Health Research*).

**Anna Gotsis Gallagher**, Assistant in Nutrition.

**Richard Bradley Gamble**, A.M., Consultant on Population Problems (*Population Sciences*).

**Margaret Gerteis**, Ph.D., Research Associate in Health Policy (*Health Policy and Management*).

**Marlene Beth Goldman**, S.D., Research Associate in Epidemiology.

**Jack Mark Goldstein**, Ph.D., Consultant on Instrumentation (*Population Sciences*).

**Thomas Barr Graboys**, M.D., Research Associate in Cardiology (*Nutrition*).

**Dana Thomas Graves**, D.D.S., D.M.Sc., Research Associate in Nutrition.

**Margaret Louise Harbison**, V.M.D., Visiting Research Associate in Respiratory Biology (*Environmental Science and Physiology*).

**Sara Harkness**, Ph.D., Research Associate in Maternal and Child Health and Lecturer on Population Sciences.

**Patricia Henson**, Ph.D., Research Associate in Radiobiology (*Cancer Biology*).

**David Urius Himmelstein**, M.D., Research Associate in Human Variability (*Population Sciences*).

**Hugh Robert Holtrop**, M.D., Research Associate and Lecturer on Population Studies (*Population Sciences*).

**Frederic Gallatin Hoppin, Jr.**, M.D., Research Associate in Physiology (*Environmental Science and Physiology*).

**Chang-I Hua**, Ph.D., Research Associate in Population Studies (*Center for Population Sciences*).

**Anne Therese Hunt**, S.D., Research Associate in Biomedical Computing (*Health Sciences Computing Facility*) and Lecturer on Biostatistics.

**Joseph Michael Hunt**, S.M., Research Associate in Human Ecology (*Population Sciences*).

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**Andrzej Stefan Krolewski**, M.D., Research Associate in Epidemiology.

**Eva Hedvika Krug**, S.D., Visiting Scientist in Toxicology (to December 1985).

**Steven Lampert**, M.D., Research Associate in Cardiology (*Nutrition*).

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**Robert Alan Lew**, Ph.D., Research Associate in Nutrition (to December 1985).

**Stephen Paul Lewontin**, A.M., Research Associate in Economic History (*Population Sciences*).

**Howard Lewis Liber**, Ph.D., Research Associate in Radiobiology (*Cancer Biology*).

**Robert Denis Lynch**, S.D. in Nutr., Research Associate in Nutrition.

**Najwa Hanna Makhoul**, Ph.D., Visiting Research Associate in Population Sciences.

**Robert Burnett McGandy**, M.D., M.P.H., Consultant on Pathology (*Nutrition* and *Cancer Biology*).

**Stephan Sherman Miller**, Ph.D., Research Associate in Microbiology (*Cancer Biology*).

**Gerald Murray**, Ph.D., Research Associate in Population Studies (*Center for Population Sciences*).

**Hatsumi Nagasawa**, Ph.D., Research Associate in Radiobiology (*Cancer Biology*).

**Christian Orrego**, Ph.D., Research Associate in Cancer Biology.

**Panagiotis Pantazis**, Ph.D., Research Associate in Nutrition.

**Ralph J. Parod**, Ph.D., Research Associate in Physiology (*Environmental Science and Physiology*).

**Joseph Piesman**, S.D. in Tr.P.H., Research Associate in Tropical Public Health.

**Philip Jack Podrid**, M.D., Research Associate in Cardiology (*Nutrition*).

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**Stephen Norman Rudnick**, S.D. in Env.H., Research Associate in Environmental Health Engineering (*Environmental Science and Physiology*).

**Peter Barry Ryan**, Ph.D., Research Associate in Air Pollution (*Environmental Science and Physiology*).

**Richard Benson Saltman**, Ph.D., Research Associate in Political Science (*Health Policy and Management*).

**Sonja Sandberg**, Ph.D., Research Associate in Clinical Decision Analysis (*Institute for Health Research*).

**Sitthivet Santikarn**, Ph.D., Research Associate in Nutrition.

**Daniel Henry Seeley**, Ph.D., Research Associate and Lecturer on Biochemistry (*Population Sciences*).

**William Allan Skornik**, S.M., Research Associate in Physiology (*Environmental Science and Physiology*).

**Charles McAfee Super**, Ph.D., Research Associate in Psychology (*Nutrition*).

**Theresa Dorothy Sweeney**, Ph.D., Research Associate in Physiology (*Environmental Science and Physiology*).

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**Clayton Lay Thomas**, M.D., M.P.H., Consultant on Human Reproduction (*Population Sciences*).

**Robert Scott Umans**, Ph.D., Research Associate in Radiobiology (*Cancer Biology*).

**Agnes Maria Van Langenhove**, Ph.D., Research Associate in Nutrition.

**Helene Vetrovs**, Assistant in Radiobiology (*Cancer Biology*).

**Edward Francis Voelkel**, Research Associate in Toxicology.

**Lance Arthur Wallace**, Ph.D. Visiting Scientist in Environmental Science and Physiology.

**Michal Walski**, D.Sc., Visiting Research Associate in Environmental Science and Physiology.

**Christian Bruce Wenger**, M.D., Ph.D., Visiting Research Associate in Physiology (*Environmental Science and Physiology*).

**Carmen Alonso Whipple**, Ph.D., Research Associate and Lecturer on Population Studies (*Population Sciences*).

**Adele Wolfson**, Ph.D., Research Associate in Reproductive Biology (*Population Sciences*).

**Jack Mikhail Wolfson**, Ph.D., Research Associate in Environmental Health Sciences (*Environmental Science and Physiology*).

**Yukio Yanagisawa**, D.Eng., Visiting Research Associate in Physical Sciences and Engineering (*Environmental Science and Physiology*).

**Stella Bernadette Yen**, M.D., M.P.H., Research Associate in Epidemiology.

**George Yerganian**, Ph.D., Senior Research Associate in Cytogenetics (*Population Sciences*).

**Sally Zierler**, Ed.M., Dr.P.H., Research Associate in Epidemiology.

# Professors Emeriti

**Paul Maximillian Densen**, A.B., S.D., A.M. (hon.), Professor of Community Health, Emeritus (1980).

**Dana Lyda Farnsworth**, A.B., S.B., M.D., S.D. (hon.), Henry K. Oliver Professor of Hygiene, Emeritus (1971).

**Melvin William First**, S.B., S.M., S.D., Professor of Environmental Health Engineering, Emeritus (1985).

**Roy Orval Greep**, S.B., S.M., Ph.D., A.M. (hon.), S.D. (hon.), John Rock Professor of Population Studies, Emeritus (1974).

**David Mark Hegsted**, S.B., S.M., Ph.D., A.M. (hon.), Professor of Nutrition, Emeritus (1980).

**Nathan Keyfitz**, B.Sc., Ph.D., Andelot Professor of Sociology in the Faculty of Arts and Sciences and of Demography in the Faculty of Public Health, Emeritus (1983).

**Alexander Hamilton Leighton**, A.B., A.M., M.D., A.M. (hon.), Professor of Social Psychiatry, Emeritus (1975).

**Robert Balentine Reed**, A.B., A.M., Ph.D., A.M. (hon.), Professor of Biostatistics, Emeritus (1982).

**Roger Randall Dougan Revelle**, A.B., Ph.D., S.D. (hon.), A.M. (hon.), L.H.D., LL.D., Richard Saltonstall Professor of Population Policy, Emeritus (1978).

**Elizabeth Prince Rice**, A.B., S.M., Associate Professor of Public Health and Social Work, Emerita (1967).

**William Morris Schmidt**, S.B., M.D., A.M. (hon.), Professor of Maternal and Child Health, Emeritus (1973).

**John Crayton Snyder**, A.B., M.D., LL.D., Professor of Population and Public Health, Emeritus (1976).

**Fredrick John Stare**, S.B., S.M., Ph.D., M.D., A.M. (hon.), S.D. (hon.), D.Sc. (hon.), Professor of Nutrition, Emeritus (1980).

**Thomas Huckle Weller**, A.B., S.M., M.D., LL.D. (hon.), Richard Pearson Strong Professor of Tropical Public Health, Emeritus (1985).

**James Laverre Whittenberger**, S.B., M.D., A.M. (hon.), James Stevens Simmons Professor of Public Health; Professor of Physiology, Emeritus (1982).

**Jane Worcester**, A.B., Dr.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology, Emerita (1977).

**Alonzo Smythe Yerby**, S.B., M.D., M.P.H., Professor of Health Services Administration, Emeritus (1982).

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